ARCHITECTURAL DECORATION.

A REPORT PRESENTED TO THE PREFECT OF THE SEINE, BY MM. LEPERE AND HITTORFF, ARCHITECTS TO THE NEW CHURCH OF SAINT-VINCENT-DE-PAUL.

SIR,

As the present state of the works of the church of Saint-Vincent-De Paul allows us to direct our attention to its decoration, we have the honour of submitting to you our ideas on the most suitable application of historical painting and sculpture to the complete decoration of that edifice.

In studying the most remarkable remains of those ages in which the arts flourished, it is constantly found that the work of the architect has always been completed by the productions of the painter and sculptor, and that those edifices exhibit, in the happy alliance of the three arts, the most powerful effect that man can produce ; an effect as attractive as it is imposing.

In connection with this, a fact not less important presents itself to the investigation of the artist : it is, that wherever this union of architecture, painting, and sculpture, has produced a truly great work, one presiding mind has directed the whole.

If there are but few instances in which an individual has practised the three arts with sufficient excellence to conceive and execute completely such a monument, there are many buildings prepared by the architect to be decorated with paintings and sculptures, which have been confided to a single painter and sculptor. This has been found the most certain means of obtaining the embellishment of an edifice in character with the architectural design, and which, so far from destroying or weakening the effect of the latter, has given it all its value.

It was thus that the immortal works of ancient Greece and Rome, and the best works, not less remarkable, of modern art, were produced.

It is quite evident that this offered the most rational method of proceeding. The force and clearness of the design agreed with the conception and execution, while the harmony, a quality without which there can be no perfect production, could only be derived from one and the same impression, which, in the infinite diversity of details, maintained the unity of the whole.

If it be true that the Parthenon and other celebrated buildings of ancient or of modern times owed their rare beauty not only to the great artists who produced them, but also to the application those artists made of the principles of which we have just spoken, it is no less certain that many of the later edifices, not very remarkable in themselves, but in which these principles have been put in practice, present equally the admirable effect of harmony and unity, an effect which can only be produced by a regard to these elements of beauty, and which cannot be secured when they are neglected.

In the later edifices, among which we may mention the Basilique of Monreal, and the Chapel Royal of Palermo, as correct imitations of Grecian art, the historical decoration, applied in the manner of mosaic, which is the only unique system of decoration, is employed in such a manner as to leave no doubt upon two points—that the edifices have been designed for the paintings, and the paintings for the place, they occupy.

We there see numerous paintings which, in their subjects, importance, number, and composition, their order and arrangement, have been regulated by the architectural character, under the guidance of the mind which formed the ordonnance.

In reflecting upon the order and majesty of these churches as complete works, and upon the poetry and moral of their decorative detail, we understand how it is that the grandeur of the whole is owing almost entirely to the unity of the design. We also perceive that the impression would have been in a great degree, if not entirely, destroyed if the general system of decoration had been divided among a great number of artists, whose varied conceptions, and different styles of execution, would have prevented this unity : indeed, one is convinced, that the individual merits of these artists would not have recompensed this loss.

Nor is this all : the extraordinary effect of these buildings is not entirely produced by employing the same style in all their parts ; but is in some degree due to the introduction of grounds of a similar colour. The employment of gold for these grounds proves moreover that it was not the intention of the artists to conceal the walls, but to give the stone the appearance of a precious material. The character, at once grave and simple, in the attitude and expression of the figures, as well as in their execution, at once dismiss the idea of the presence of a wall of gold ; consequently there are none of those disagreeable effects produced by grounds of all colours and of every kind, by prominent and receding figures, and by the constant endeavour to introduce those illusions, so undesirable in mural historical painting, showing vacant instead of occupied spaces, undulating lines where there should be plain surfaces, interfering with the architectural forms, which the painter ought to preserve and make prominent, and not to impair or hide.

After these remarks we trust, Sir, that you will approve of our having consulted, in the design of the church of St. Vincent de Paul, the principles of an architectural decoration founded on reasons so solid, greatly wishing that our end may be obtained, and that you will assist us in the choice and number of the artists who are there to be employed.

Such being our hopes, and such our manner of viewing the accomplishment of our task, circumstances of not less influence strongly fortify our intentions. We allude particularly to the extraordinary contemporaneous researches of our artists and men of science, whether for the re-introduction of encaustic painting, that precious gift of antiquity, for the revival of the art of painting on glass, the admirable invention of our ancestors, or finally, the discovery of the method of painting in lave emaillée, which unites all the qualities of the mosaic and the *majorique*, with many other advantages of the greatest importance.

This combination of circumstances coinciding with the developement of a principle of decorating, for the application of which these new means of material execution seem to have been made on purpose, and which doubtless would have given birth to the principle if it had not already existed ; this union cannot fail to stimulate us in the design of completing our edifice, for which art and science have just placed their discoveries at our disposal.

We have therefore included in our design for the general and monumental decoration of the church of St. Vincent de Paul the three above mentioned descriptions of painting :—

The painting in lave emaillée for a series of pictures and ornaments which are to decorate the end and wall of the porch, the friezes and fillets on the outside of the building.

Encaustic painting, for decorating the surface of the walls, the friezes, ceilings, and fillets of the interior.

Lastly, Painting on glass, to be employed in all the windows through which light is admitted into the edifice.

When we examine the temples of ancient Egypt, or restore in ima-

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gination the ancient monuments of Greece, Sicily, or Italy, we perceive everywhere the application of historical painting, employed not merely in the interior, but also in the exterior of such edifices. The same has been the practice of modern times, in Sicily, France, and Italy, and even in the northern countries; for we find numerous examples of this mode of decoration in the façades of many buildings erected in the principal towns of Germany, and even in the ancient and modern capitals of the Russian Empire. These examples of a general tendency, among all nations, to employ on the exterior and interior the universal language of painting to the characteristic expression of the edifice, proves also that difference of climate renders the application of colour to the exterior more or less durable as we pass from south to north: thus we find that colours last longer in Egypt than in Southern Europe; and longer in the latter than in the more northern climes. It follows then, that painting can only be rationally employed in those countries where the climate secures the durability of its colours. The ancients attained this object by the use of mosaic; the majorique was employed at the time of the revival of art; but nothing has succeeded so well, under all circumstances, as the lave emaillée.

More durable than mosaic, and more under the management of the painter for the perfection of his work, this style of painting, in its application to the exterior of St. Vincent de Paul, will rival the most remarkable productions of art. It remains, then, only to make a suitable use of this new and precious national discovery; to stamp by its means upon this monumental edifice, in the most decided manner, the essentially religious character which is to distinguish it at first sight from a secular building. The porch which is to be painted having been especially planned for this kind of decoration, should not be deprived of it: to do so would be in effect to leave in an incomplete and unfinished state an important part of the principal façade. You will also approve, Sir, of its use for the decoration of the fillets and friezes, instead of sculptured ornaments. Without attributing too much importance to this application, and the harmony and affinity between the porch and the other parts of the building which will be the result, there will be, and this will give it the preference, a certainty that it will never change. When we observe the sculptured friezes which decorate our ancient and modern buildings, from the cathedral of Notre Dame to the church of the Madeleine, we see how much these sculptures are exposed to the destructive effects of our climate: the dirt which collects in the projecting parts, the vegetation which this engenders, the dark tint which the stone assumes, are inconveniences which, though they do not entirely destroy the forms portrayed, impart to them a disagreeable aspect, and too often injure the building which they ought to embellish. In this point of view, as in many others, the advantages of this kind of painting for exterior decorations are incontestable.

For the decoration of the interior, we have considered encaustic painting the most suitable. The successful experiments upon, or rather the well-considered application of this process in the capital of Bavaria and the castle of Fontainebleau, leave us no doubt of its superiority over fresco and oil painting. It is well known that the latter constantly becomes more and more darkened, and the change of tone destroys by degrees the effect which the painter wished to obtain, while at the same time the glare which is inseparable from it prevents the spectator, when viewing it in one unalterable aspect, from clearly distinguishing the different parts of the composition. Fresco painting presents disadvantages no less serious. Change of tone is inseparable from it, although in a different way; viz., in losing its primitive vigour; so that, after a time, it differs materially from its first appearance; besides which, it has not a sufficient capability of resisting the influence of a climate so variable and humid as ours. Above all, as this description of painting can only be performed on a coat of fresh mortar, which can hardly be made to adhere well to stone, it cannot well be employed in this edifice.

Painting on wax offers none of these inconveniencies. Its use in the church of St. Vincent-de-Paul will appear to you, Sir, so much the more desirable, as it will give the means of obtaining the vigour of oil colours and the freshness of fresco, uniting the qualities of both.

As to painting on glass, although it may appear, at first sight, little capable of showing to advantage in an edifice where the same species of decoration is applied to the walls, and the architectural character of which is widely removed from that of buildings called Gothic, where the system of glass painting has been fully carried out, we are yet, Sir, persuaded, that the reasons we are about to mention will induce you to agree with us in opinion that it will be highly suitable on the present occasion, and will be certain of producing a great effect.

When the use of mosaic, composed of an infinite number of small squares of vitrified material, had led to the employment of larger pieces of the same substance for filling the apertures by which light was admitted into buildings, this new kind of embellishment was not considered in the light of an architectural decoration. The first application of painted glass was merely for the purpose of tempering the glaring light of the sun, and of colouring its rays. When thus employed, we can easily understand that a mural painting, placed near a window, was better distinguished when the dazzling light of white glass was replaced by the less powerful rays of painted glass. It may also be conceived, that in thus colouring at will, by stained glass, the rays of the sun in the interior of an edifice, the paintings, instead of being subject to a constant variation in the degree of light through white glass at every period of the day, received from the coloured medium a more constant light; for, although it might vary in intensity, it could not injure materially the effect originally intended by the artist.

For these reasons it cannot be doubted, that painting upon glass in the church of St. Vincent de Paul would have a good effect, both as regards the edifice and the paintings themselves. To be certain of this, it is only necessary to observe for an instant, the manner in which this church is lighted. This is by means of windows placed laterally in the walls of the upper galleries, and in those of the lower chapels, by a circular window, placed above the organ gallery; and lastly, by the semi-circular opening formed in the roof of the chancel. As the windows in the upper gallery are to exhibit the paintings of the nave, the colour of the glass must be so selected as to give them the most advantageous light. We shall thus be able to obtain the means of representing the religious attributes which ought to form the decoration, and to combine them in such a manner that they will present in their ensemble the appearance of a transparent tapis, of which the ruling colours should be those which will give effect to the paintings; an effect which will be the more certain as, from the point of view most suitable for the examination of the paintings, the windows themselves will not be seen.

The large circular window above the organ gallery, the light of which must not fall direct upon the paintings, will represent St. Vincent de Paul ascending to heaven, in a glory surrounded by clouds, and will complete the arrangements for lighting the nave.

The large semicircular light of the absis will represent the radiant glory of Jehovah, and through this a most brilliant mass of light will fall into the sanctuary.

Finally, on the glass of the windows of the lower chapels will be represented the different saints to whom the chapels are to be dedicated, in characteristic attitudes; and the light will pass through the glory by which they will be surrounded.

Thus you perceive, Sir, that by this arrangement everything is combined so as to present one general system for the distribution of light; the result will be novel, complete, and satisfactory, both in the material effect and the abstract idea; and it will prevent any appearance of similarity between this church and the edifices of a more secular destination.

It only remains now, Sir, to offer you our ideas on the number, size, and choice of the subjects of the paintings in lave emaillée and encaustic.

The first, intended for the decoration of the porch, will represent in thirteen pictures, the same number of subjects drawn from the Old and New Testament, and in the intermediate niches thirty-two busts of saints. The fillets and friezes of the façade are to contain medallions, with the heads of angels, religious attributes, and other ornaments appropriate to the character of the building.

For the paintings in the porch, we thought of proposing to you a selection from the splendid biblical compositions of Raffaelle, in order that their reproduction in lave emaillée may assure to the fine arts and to France an enduring possession of these chefs-d'œuvre, the originals of which, already much deteriorated by time, hasten daily to total destruction. To adopt this idea would greatly facilitate the execution of these pictures, as skilful artists might immediately be employed to make these copies, and at a comparatively small cost. In fact, among those of our historical painters who might undertake this work, but few have as yet practised this kind of painting. If original pictures, therefore, were adopted, it would be necessary always to make the compositions on a small scale in the first place, and afterwards to re-copy them in the intended size; a method which would be more costly, and at the same time be less certain of success. These compositions of Raffaelle stand so high in public estimation, that all who really appreciate the arts could not but rejoice at the execution of such a project. In either case, Sir, whether you adopt this idea, or whether you should think proper to commission one of our artists to make compositions for the decoration of the porch, this part of the edifice will become one of the most remarkable productions of the age.

The encaustic paintings for the interior of the church, will be as follows:—

1. In the nave, a frieze 92 metres by 2·66, will bear a representation of the most remarkable episodes in the life of St. Vincent de Paul.

2. In the sanctuary, a frieze of 50 metres by 2·66, is destined for a representation of the seven sacraments; besides which, on the great vault of the apsis will be portrayed the apotheosis of St. Vincent de Paul.

3. In the Chapel of the Virgin, a semicircular painting will represent the marriage of Mary, and upon the walls, the niches, and the vaulted roof, will be other episodes in her life.

4. At the extremities of the Chapels, four paintings, 5·50 by 5 metres, will represent the Baptism of Christ, his Transfiguration, his Resurrection, and the Last Judgment, where the Redeemer will appear as Judge.

5. On parts of the walls of the eight chapels will be many subjects from the Lives of the Saints to whom these chapels will be dedicated.

6. Finally, in the upper galleries, will be sixteen figures of saints, and six paintings representing subjects drawn from the lives of other blessed.

All these pictures will be executed with backgrounds of gold.

After this enumeration, comes naturally the question, how that unity and harmony are to be arrived at, without which, our intention and our wishes may in some respects fail of accomplishment.

It is easy to have all these paintings executed by skilful artists: the difficulty is, so to distribute them among the artists, having regard to the character of their style, as to offer a guarantee that the *ensemble* shall be harmonious. With this view, the series of paintings for the nave and the sanctuary, which form the principal decoration of the edifice, ought to be entrusted to but one, or, at most, two artists, one of whom may execute the thirteen subjects drawn from the life of St. Vincent de Paul, and the other, the grand vaulted roof, and the seven sacraments of the frieze beneath.

Without insisting again on the well-proved advantages of this concentration of the work, we will add, that by the simultaneous employment of a number of artists, their very merits would be a shoal to wreck them on, and would do almost as much harm as their faults. A reasonable restriction of their number would prevent these discordances, as well as the reproduction of the same personage under different characters, thus destroying, in each picture, the connection which should unite all the episodes of his history. Put these inevitable disappointments in comparison with the prospect of attaching your name to works which may attain, in after-ages, the renown of the Pœcile of Athens, the halls of the Vatican, or the Cloisters of the Chatreux, and you will not hesitate, Sir, what part to take. Indeed, it may be safely affirmed, that a more fortunate conjuncture of circumstances, a richer and more magnificent plan, or more happily disposed to excite the genius of architects, and to favour the production of immortal works, has scarcely ever been offered. To allow so rare an opportunity to escape, which you probably will never have again, how brilliant soever may be your future administration, would be to excite the poignant regret of all who are capable of appreciating the loss, irreparable to the arts, to which the division of this work among numerous artists would inevitably give rise.

We do not, however, lose sight of the fact, that although art itself ought to be our primary consideration in this matter, still the interest of men of talent, who have a right to be competitors in so important an undertaking, deserves some consideration. You, Sir, will enter into our feelings in this respect, and will agree with us, that having reserved the nave and the sanctuary of the church to one or two artists, there will still remain employment for many others in the other parts of the building.

The Chapel of the Virgin, the eight chapels below, the four large paintings at the extremity of these chapels, and the pictures in the upper galleries will be so many pages of art to fill, and to execute which, as many artists may be employed as there are pictures. As these pictures would never be seen together, as they would present isolated subjects, and as their golden backgrounds would compel the artists who executed them to the use of nearly the same tone of expression, the union of various talent upon them does not present the same inconveniences as in the case of the nave and the sanctuary. These considerations, we trust, will remove all objections to the plan we propose, as far as regards the painting of this edifice.

We now come to the sculpture. The principal works of this kind that will be required are:

1. The subject in relief which is to adorn the front of the porch.

2. The statues of St. Peter and St. Paul, to fill the niches on each side of the porch.

3. The statues of the Four Evangelists, to surmount the balustrade of the principal elevation.

The subject of the pediment will be St. Vincent de Paul, animated by the spirit of charity, in the midst of a group of persons the fittest to give effect to his words and example:—members of the clergy, whom he assisted in reforming; orientals whom he converted to the Christian religion; prisoners whom he liberated; poor whom he consoled and succoured; Sisters of Charity whom he instructed to nurse the aged invalids and to take charge of destitute children, and men and women of the world in whose hearts he revived the sentiments of humanity;—such will be the figures which, grouped in various attitudes, will completely occupy the triangular compartment of the tympanum.

A subject like this might reasonably be expected to inspire the artist, and become a model of its kind, and the figures should be executed in relief.

By this means they will stand detached, and thus avoid the defect of modern pediments, where the introduction of figures in bas-relief destroys the effect of the masses, sullies the purity of the contours, confounds the figures with each other, and renders the whole composition a mass of indistinctness.

We have, in fact, so planned the tympanum of the porch of the church, that all the figures employed in its decoration will be placed, as it were, in a triangular niche. This arrangement, which the Greeks have adopted in their most finished monuments, possesses the great advantage of permitting the effect of the plaster models to be tried beforehand in the actual places the statues are to occupy. Besides this, the sculptures of the pediment, constructed of soft stone, may be executed in marble, or some other durable and costly material. We thereby avoid a great number of pieces, and a multiplicity of joints.

You may thus, Sir, give birth to a species of design unknown to French statuary, in seconding our endeavours to have these sculptures executed in French or Italian marble. As the models can be sent to the quarries, the stones may be returned of the proper size and shape, a mode of economising which will greatly reduce the difference in price between stone and marble. But this trifling difference can never be put in comparison with the advantage accruing from the greater durability of the more costly article. It is only necessary to glance at the front of the Madeleine to see, at the end of two years, numerous indications of decay, by the appearance of the opening cracks which furrow the figures, and which, already injuriously affecting them, will end in their total destruction. These important considerations induce us to express an earnest desire, that the six other statues of the façade should be executed in marble.

The same principles of harmony apply to the sculptures as to the paintings. To attain this, one artist should execute the whole of the front, and another the four figures on the terrace. This arrangement is rational; for as the Four Evangelists are placed near each other on the same line, forming as it were a prolongation of the columns of the portico, their masses should balance each other in like manner as the columns below them, so that the proportions of their different parts may offer relations analogous to those which the parts of the columns themselves present. For the two figures in niches, as they cannot be seen together, we see no objection to entrusting them to different hands.

In fact, there are not so many causes of discrepancy between the productions of different sculptors as between those of different painters; and consequently it would be easier to obtain the necessary agreement between a number of statues which appertain to one design, than between paintings in the same category; but it is no less certain that very great differences may still exist, and that, to arrive at as satisfactory a result as possible, it will be desirable to allot the different pieces of sculpture in some such way as we have just mentioned.

In entering, Sir, into all these details, we have fulfilled a duty which respect for the arts, and our desire to present you a finished work, have imposed upon us. You can appreciate the lofty aim we have in view, and consequently the extreme importance of your aid in obtaining, for the church of St. Vincent de Paul, that *ensemble* which is found in no other great monument of our epoch. We have thus wished you to convey to the members of the municipal council, whose concurrence is not less indispensable to our design, a clear idea of the monument for which Paris may some day be indebted to their enlightened and active co-operation. They will appreciate the influence it will have upon the progress of the arts themselves, as well as the developement and prosperity of all the industrial professions which appertain thereto.

It rests then with you, Sir, and the members of the municipal council, to leave to time and to generations yet unborn, a sacred edifice, worthy of the idea conceived by one of the most celebrated architects of the Renaissance, Leon Baptiste Alberti, when he observed, "A temple should unite so many beauties and wonders as to strike the beholder with astonishment, and compel him in an excess of admiration to cry out, This is a habitation truly worthy of God."

THE DUTCH ARCHITECTS.

A LETTER FROM M. WEENINK, TO T. L. DONALDSON, ESQ. (COMMUNICATED BY MR. DONALDSON.)

DEAR SIR,

MR. ZOCHER, from Haarlem, was here two days ago: he wished me to write to you to apologize for not having sooner satisfied your demand for some biographical sketches of the Dutch architects. He brought me the following list in Dutch, desiring me to translate it, and communicate it to you without delay, and I have the pleasure to fulfil this commission.

Jacob Van Kampen,—born at Haarlem. The date of his birth is not precisely known: he died in March, 1658, and was buried at Amersfoort. He went to Italy as a painter, but there his studies changed to architecture. The Stadhouse (actually the Royal Palace), at Amsterdam, the Hotel of Prince Maurits (now the museum of paintings), at the Hague, and several tombs in the churches of Amsterdam, are testimonials of his great talent.

Salomon de Brai,—born at Haarlem, mentioned by Scammozzi. The new church at Haarlem was built by him about the middle of the 17th century. Some of his paintings are seen in the Orange-house, near the Hague.

Daniel Stalport,—architect at Amsterdam, was a contemporary of Jacob van Kampen. He built, in 1650, the hospital called Weduwenhof.

Cornelis de Ry Danckerts, an eminent architect of Amsterdam, was born in 1561, and died in 1634. He was the son of Cornelius Danckerts, also a good architect. The Exchange at Amsterdam, and the gate called Harlem Gate, were built after his plans.

Hendrick de Keyser,—town architect of Amsterdam, was born at Utrecht, 1565, and died in 1621. He built the north, south, and west churches of Amsterdam. He was also an eminent sculptor: the Mausoleum of William I., Prince of Orange, was composed and executed by him. Some of his paintings, too, are much esteemed.

Jacob Vennekool,—was also an eminent architect of Amsterdam. He lived about the middle of the 17th century.

Simon Bosboom,—architect of Amsterdam, was born at Embden, in 1614. The contemporary of Jacob Van Kampen, he was also his collaborator on several occasions. He was moreover a good sculptor; and his work on architecture has long been the hand-book of the Dutch workmen.

Paulus Moreelse,—born at Utrecht, in 1571. He was a clever architect, painter, and engraver. He built the Catherine Gate, at Utrecht, and his portraits and engravings are much esteemed. He died in 1638, while filling the office of Burgomaster of Utrecht.

Philippus Vingboons,—was the architect of the most splendid buildings of Amsterdam, viz. the Hotel of Trip, now the Museum of Paintings, and others; and of several fine buildings in other towns. He published his works in 2 folio volumes, Amsterdam, 1715.

——— *Dorsman,*—was an architect of Amsterdam. The new Lutheran Church was built by him in 1668. J. Goeree, the Dutch poet, praises him in his Miscellanies. His portrait is engraved in mezzotinto.

Peter Esaia Duijvene,—was born at Amsterdam, in 1760, and died in 1801. He has published an architectural work.

Anthony Hattinga,—from Rotterdam. The town-gate called the Delft Gate was built after his designs.

Jacob Husly Otten,—was an eminent architect of Amsterdam. The Institution *Felix Meritis* was built by him. He died, middle-aged, in 1795. He was an intimate friend of the celebrated Professor Camper.

Petrus Post,—architect of the Prince of Orange, was an artist of high reputation. He built the new church at the Hague, in 1649; also the Orange House, the summer residence of Amelia de Solms, the dowager of Frederick Henry, Prince of Orange, and many other important buildings.

Abraham van der Hart,—Town Architect of Amsterdam, was born in 1747, and died in 1820. The New House of Correction, and the House for Roman Catholic Female Orphans, were built under his direction and after his plans.

Bartholomew Wilhelmus Hendricus Ziesenis,—son of Anthony Ziesenis, the sculptor, was born in Amsterdam, in 1762. He was architect to Louis Napoleon, King of Holland, and afterwards to William I. He was also a clever sculptor. He married the celebrated actress Wattier, and died at the Hague in 1820.

This was rather a difficult task for our friend Zocher, for although we have Van Mander, Houbraken, Van Gool, Weyerman, and other biographers of the eminent painters, sculptors, and engravers, it seems that nobody thought of publishing that of architects, excepting Mr. Immerzeel of Amsterdam, who is collecting all the particulars he can find, to write an entirely new Biography of the Dutch artists in general; and he, of course, keeps the details of his collection secret for the present—the first volume of his work is not expected under two years. Mr. Immerzeel is a good writer, a fine poet, and well skilled in the fine arts; and his work will undoubtedly be much more interesting than the other biographies, as they are written in a dull style, except that of Jacob Campo Weyerman; and he is so incorrect, and has published so many apocryphal tales, that his writings have entirely lost their credit.

In perusing the published descriptions of buildings, I often looked in vain for the names of their architects. I could easily conceive the reason of this neglect in the case of churches built by the Roman Catholic clergy before the Reformation, because their plans were furnished from Germany or Italy, and a century or two often elapsed before the building was finished. But this reason does not apply to churches built since that period, nor to other public buildings. I generally met with the names of the founders of these buildings, of those who had laid the first stone, and even of the painters and sculptors who decorated them; but seldom the name of the man who planned the whole, and guided the others by his genius. Vexed that so little notice had been taken of the eminent architects of this country, I have been in the habit of taking notes, for my own amusement, of the names of such of them as I happened to light upon in my reading, by which I am enabled to add a few particulars to the list furnished by Mr. Zocher, and which are as follows:—

Matthys Scerendonck,—architect of Bois-le-duc, in the middle of the 16th century. He was a great mathematician and clock-work maker.

Willem Keur,—from Gouda, is mentioned by Guicciardini the historian as one of the first architects of his time (16th century).

Jan of Henegouwen,—born in Hainault, was the original architect of the high tower of Utrecht, called the Doms tooren: this tower was begun in 1321, and finished in 1482.

Jacob van der Burch,—architect of Utrecht, is supposed to have finished the Doms tooren. He was called to Delft, to demolish the old choir of the New Church, and to build a new one.

Pieter Corre and *Cornelis van Driel,*—Town Architects of Rotterdam, built the town gate called the Oostpoort, in 1613.

Hendrik van den Heuvel,—architect of Rotterdam. The Roman Catholic church called Prinsen-kerk was considerably enlarged under his direction in 1639.

Klaas Jeremias Persoons,—architect of Rotterdam, has built several capital houses, and was superintendent of the churches. The foundations of the tower of St. Laurentius having suddenly given way, in 1651, whereby it became deflected 3½ feet from the perpendicular, Persoons succeeded in bringing it back to its former position, and renewing the foundation, without the slightest accident.

Johan de Vouw,—architect of Rotterdam. He drew the original chart of that town, representing all the houses and public buildings, which was engraved and published by Romein de Hooghe, 1694.

Wouter Ariensz van Egmont,—architect, built the West India House at Rotterdam.

Jacob Lois,—architect of Rotterdam. The Government House of Schieland, the foundations of which were laid in 1662, was built under his direction. He was sheriff of Rotterdam in 1664-5. He wrote a Chronicle of that town up to 1671.

——— *Romans,*—architect of William III., at Breda. The Royal Chateau at that town, which was begun by the Italian architect Bologne, remained unfinished for a time, but was completed by Romans in 1696.

Daniel Marot,—born in Paris in the middle of the 16th century. His family came to Holland on the revocation of the Edict of Nantes. He resided at the Hague, where he was architect to William III., and where he built several splendid edifices, viz., the Hotel of Wassenaar, now inhabited by the king; the royal summer residence Loo, &c. He published a work on Architectural Decoration, Amst. 1772.

Tieleman van der Horst,—architect of Amsterdam, was in much reputation for the construction of sluices and other hydraulic works. He published, in 1739, "Theatrum Machinarum universale—Treatise of Architecture for Plans, Stairs, &c.," 4to. Also an hydraulic work concerning waterworks, sluices, locks, cisterns, bridges, &c., 2 vols. folio, Amst. 1757.

Jacob Eduard de Witte,—Town Architect of Amsterdam. He built, in 1774, the present Dutch Theatre in that city, the former one, built by Van Kampen, having been destroyed by fire.

Jacob Polley,—architect of Saardam, published a work on the construction of capital roofs, Amst. 1770.

Pieter Swart,—architect of the Prince of Orange, William V. He built the splendid Hotel of Patras, at the Hague, in 1766.

Abraham Ebbenhorst,—architect of Amsterdam, built the Church of the Anabaptists in 1788.

——— *Gunckel*,—architect of the Hague, built one side of the inner court of the Old Palace (the completion of which was prevented by political considerations), the Hotel of the Prince of Weilburg, (now the Theatre,) and other splendid edifices. He died only a few years since, at an advanced age.

Jan der Greef,—born at Dordt, in 1784. He was sent to France and Italy by Louis Napoleon. The restoration and enlargement of the Royal Palace at the Hague, and of the palace of the Prince of Orange, and summer residence Soestdik, were executed by him. Called to Amsterdam as Town Architect, he pulled down part of the Charity Orphan Asylum, and rebuilt it as a Palais de Justice. He died at Amsterdam, Dec. 2, 1834.

I wish these notes had been more complete, but I had no idea, in taking them, that they would be useful. It is now my intention, however, to make some researches into this interesting subject, the result of which I shall have much pleasure in communicating to you.

THE LIFE AND WORKS OF JOSEPH BONOMI.

Joseph Bonomi, an architect who attained great professional eminence in England, was born in Rome, in the year 1739. His brother, Don Carlo Bonomi, was a distinguished theologian, and Professor of Divinity in the College of the Propaganda. Several other members of his family occupied important and dignified offices in the church, and in the civil department at Rome. Joseph Bonomi received his education in the Collegio Romano, and having afterwards chosen architecture as his profession, became a pupil of the Marchese Teodili, a Roman nobleman, who, from a love of the art, devoted himself to the study and practice of architecture. Of this nobleman it is recorded by Militzia, that he took pleasure in selecting for his pupils young men of decided talent, and in zealously promoting their improvement.

In the year 1767 Bonomi came to England by the invitation of Robert and James Adam, the former of whom had probably become acquainted with him during his stay in Italy. In their employ he appears to have remained several years, and from his skill as an architectural draughtsman, and his general knowledge of the profession, he must have proved a valuable assistant to his employers, who were then in the full career of a lucrative practice. At what period Bonomi quitted the office of his employers, and commenced business on his own account, or what circumstances led him to that resolution, cannot now be determined. His knowledge of the principles of perspective, and his skill in that kind of drawing, brought him many pupils, among whom were some young persons of noble families, and to them he was probably much indebted for his subsequent success as an architect. Among his earliest friends in London was the celebrated Angelica Kauffman, who was at that period in the zenith of her fame, and in the enjoyment of the wealth it usually bestows, courted by the nobility and scarcely less admired by the artists of the age, but by none more than by Sir Joshua Reynolds. In 1775, Bonomi was married to Rosa Florini, the cousin and ward of Angelica, who, about six years after, was herself married to Antonio Zucchi, a Venetian artist; but, although she ultimately quitted England, she continued to feel the greatest interest in Bonomi, as well as in his wife and young family. In 1783, within two years after she had left England, Bonomi was induced by her to return to Italy, with his wife and his three young children, under the expectation, no doubt, of obtaining a permanent settlement in his native country. In this hope, however, he seems to have been disappointed, for in the following year he returned to England, and from that period his independent professional career in London may be dated. It is, however, worthy of remark, that during his short stay in Italy he received the diploma of Associate of the Clementina Academy at Bologna.

On the 12th of November, 1789, Bonomi was elected an Associate of the Royal Academy, but never attained the rank of an Academician. This circumstance is intimately connected with a passage in the life of Sir Joshua Reynolds, and has consequently been noticed by Mr. Northcote in his biography of that illustrious artist. Sir Joshua seems to have entertained a very high opinion of Bonomi's acquirements as an artist, and was very anxious to connect him with the Academy as the Professor of Perspective. As a preparatory step, he endeavoured, on more than one occasion, to obtain his election as an associate. At first he was unsuccessful in consequence of some informality, but at a subsequent election in 1789, the votes were equally divided between Bonomi and Mr. Gilpin, and the election was decided in favour of the former by the casting vote of the President. Sir Joshua was next anxious to obtain for his friend an appointment to a Professor's chair in the Academy. A vacancy occurred in 1790, and every exertion was made by the President to secure his election, but the election terminated in the appointment of Mr. Fuseli by a large majority. Sir Joshua, annoyed by the result, and believing that it arose from a spirit of animosity, resigned the office of President of the Academy, and soon after withdrew his name altogether.

In 1804 Bonomi received from the congregation of Cardinals entrusted with the superintendence of the fabric of St. Peter's Basilica, an honorary diploma, appointing him the architect to that building. Long before this, in the year 1776, he appears to have been consulted on the subject of the Sacristy, which Pius VI. proposed to erect as an appendage to that edifice. The design furnished by Bonomi on that occasion, which is in the possession of his family, is singularly elegant and appropriate, and had it been adopted would for ever have connected his name with the most wonderful of all modern structures.

In his professional character Bonomi was distinguished by a high sense of the honour and dignity of the art he professed—no interested motive could ever induce him to swerve from that high and honourable course which is pointed out not less plainly by a noble mind than by the dignity of the profession. He was justly proud of the connection of his art with the science and literature of every age, and among the advantages he derived from it, considered the friendship of many distinguished artists to be one of the greatest. The unfortunate Barry found shelter and consolation at his last hour in the house of Bonomi, and under the protection of his friend, terminated his aspiring but unsuccessful career. Being taken suddenly ill at an ordinary he frequented, he was conveyed to Bonomi's residence in Great Titchfield Street, obtaining no admittance in his desolate dwelling, and there expired on the 22nd of February, 1806.

Joseph Bonomi died on the 9th of March, 1808, leaving a widow and six children. The elder surviving son is in the enjoyment of a considerable practice at Durham. The younger was educated as a sculptor, under Nollekens, and having completed his studies in Italy, resided many years in Egypt, where he was engaged in investigating the monuments of that once mighty state.

The following are the principal works designed by Joseph Bonomi. He erected a gallery and a small church at Packington, in Warwickshire, for the Earl of Aylesford. Its form is that of a perfect Greek cross, enclosed within a square. The centre of the building is groined, and rests upon four Pæstan columns. It is lighted by three windows of a semi-circular form, concentric with the great vault. The effect of the light, thus introduced at a considerable height from the floor, is very beautiful. The construction is of stone, without either wood or iron. The exterior is plain in its character, corresponding with the interior. Each front is surmounted by a pediment, flanked by small cupolas over the lower vaulting of the corners. In 1790 he made considerable alterations in, and additions to, Langley Hall, Kent. In 1792 he executed the chapel of the Spanish Embassy, in Spanish Place, Manchester Square, London. Although small in size and presenting no external architectural features, the interior is exceedingly pleasing. The nave and side aisles are divided by a row of Corinthian columns supporting a vaulted roof, and the end of the nave terminates in a sanctuary. In 1793 he erected Eastwell House, in Kent, for G. F. Halton, Esq., the father of the present Earl of Winchelsea; and in 1794 a pyramidal Mausoleum, with an elegant chapel vaulted in the hollow of the pyramid, in Blickling Park, Norfolk, to the memory of John, second Earl of Buckinghamshire. He built also, about the same date, Longford Hall, Salop, for R. Leake, Esq.; and in 1797 a mansion at Laverstock, Hants, for Henry Portal, Esq. In 1803 he erected for the Duke of Argyle an Italian villa, on a large scale, at Roseneath, in Dumbartonshire, which, however, still remains unfinished. Independent of these, he prepared various designs for a library at Lansdown House, in London, for a saloon at Mr. Montague's house in the north-west corner of Portman Square, and for a sculpture gallery to have been erected at Townley Hall, in Lancashire, for Charles Townley, Esq., and various other alterations to numerous houses in town and country.

W.

EGYPTIAN ARCHITECTURE.

TOMBS, SPHINXES, COLOSSI, AND OBELISKS.

FROM THE LECTURES RECENTLY DELIVERED BY PROFESSOR DONALDSON AT THE LONDON UNIVERSITY.

All writers on Egypt seem to be agreed that the earliest specimens of Egyptian Architecture are to be found in the tombs of that country, and that the character of their temples, and other monumental edifices, is to be assigned to these types. In the valley of Biban-el-Moluck was the Necropolis or burial place of the royal family of a certain period, and the famous French work on Egypt, and the descriptions of Champollion, make us acquainted with these remarkable monuments of Egyptian art. At the further end of the valley there is a narrow opening, evidently made by the labour of man, and bearing traces of Egyptian sculptures. Through this are perceptible, at the foot of the mountains, or on the sloping sides, doors mostly blocked up, and the decoration of which is not apparent until you approach quite near. These doors are all alike, and form the entrance to the royal tombs. Each tomb has its own doorway, for there was no communication from one to another, as they were all isolated. New apertures have lately been made by parties who were in search of treasures or antiquities.

It is worthy of remark, that as there was a religious veneration of antiquity, which led the Egyptians to retain the same forms and customs as had prevailed in former periods, and from which they would not depart, shall be safe in giving a description of tombs comparatively recent, as they were doubtless identified in arrangement and decoration with those of ancient times.

No order was observed in the choice of any particular site. A king seems to have had his tomb excavated in any situation where he found a stratum of stone suitable to the numerous excavations he was about to make. The entrance doorway is generally very simple and unadorned, but as soon as the traveller passes it he is surprised, on entering a long gallery, to find all the walls covered with brilliant and elaborate paintings. Here and there are niches recessed in the sides, of various sizes, and a succession of portals. The floor was most frequently in an inclined plane, from the entrance to the further end. At intervals there are pits formed, as if either to prevent the access of forbidden intruders, or to receive a sarcophagus. Frequently there are two or three halls or vestibules, the ceilings having a concave soffit supported by square pillars, covered, as well as the walls, with hieroglyphics. Then follows another succession of galleries and a series of portals leading to the principal hall, called by the Egyptians the Golden Hall, of greater extent than the others, frequently a plain square chamber with a vast sarcophagus in the centre, which was frequently hollowed out of some rare or peculiar stone, as, for example, the famous alabaster sarcophagus of the Soane Museum, which is so transparent, that if the room be dark, and a lighted candle be placed in the centre, it presents a brilliant appearance. Sometimes they are of granite or basalt, specimens of which may be seen in the British Museum. They consist of two blocks, the body of the sarcophagus and the lid, and are covered with hieroglyphics both inside and out. Some measure 15 feet in length by 6 in width and 8 in height.

The Golden Hall is frequently decorated with square pillars or columns, which increase the richness of the architectural effect, and the roofs are cut with the forms of a slight segment of a circle or depressed pediment. Sometimes there are recesses and square niches cut into the side walls to receive mummies; and beyond the Golden Hall there may be other galleries and other sepulchral chambers. It appears that sometimes the walls were stained and sprinkled with colour to represent granite, and the galleries were closed with port-cullices of stone, so as to effectually prevent admission into the inner parts without immense efforts and doing violence to the construction; at other times the doors were merely of wood and sealed with clay, and when the priests went to perform the religious services for the dead, they were opened with great ceremony, and in the presence of members of the family. It appears that immediately each king ascended the throne, he commenced the excavation for his tomb; and thus it frequently occurs that the duration of the reign of a sovereign may be ascertained from the extent of the catacomb containing his sarcophagus.

The principal objects of admiration in these extraordinary works are the sculpture, the painted figures, and the hieroglyphics which cover the walls and sometimes the ceilings. The leading subject is the sun, the principal deity of the Egyptians, as the great vivifying agent of nature both for animal and vegetable life, and the hieroglyphics seem to consist of the most refined mysteries and abstruse allusions; he is represented on one side in a series of pictures in his course to the meridian, emblematic of the king when alive; on the other the sun is represented in his course downward towards the horizon, an image of the king after death. In the Hall preceding that called the Golden the subject represented is generally the king appearing before his judges, who are to decide the doom of his soul. In the tomb of Ramses the V. there are the forty-two assessors of Osiris, with the justifications brought forward by the king.

The form, decoration, and arrangement of these sepulchres bespeak peculiar habits and modes of thinking in the remarkable people to whom they belong. The long galleries which seem applicable to no useful purpose, the splendid paintings which were rarely seen, and that only by artificial light, the costly nature of the sacred deposit, so seldom visited, evince certain associations which find no correspondence with the customs and usages of modern times. With us the exterior of a tomb attracts attention, but the interior offers no embellishment. With the Egyptians the outside appears to present no unusual appearance, and an insignificant door marked the access to the royal cenotaph, but the interior was profuse in every arrangement and decoration which could interest and enchant the beholder, and the king enshrined in his tomb was surrounded by the splendour of a living monarch, accompanied by his attendants, shadowed in the painted sculptures on the rocky walls. The mummies of his friends and favourites occupied the parts of the royal cenotaph, and formed so many links in the grandeur of the scene in the estimation and affections of an Egyptian.

But these sepulchral excavations were not alone made for royal and distinguished personages, but the mummies of sacred animals were honoured with a similarly important funeral deposit. Near Beni Hassan-el-Aamar, there is a hill perforated with galleries and wells, on which has been found an incredible number of mummies of cats, crocodiles, and some other quadrupeds; near this is a temple dedicated to the goddess Pascht (Bubestis), to whom the cat was consecrated as a sacred animal.

The most wonderful excavations of this people are those of Abou-Simbel, the largest of which was opened by Belzoni. One face of this is cut out of the rock so as to give the appearance of a handsome façade, the others are almost covered by sand. The front is 117 feet wide

by 86 high. From the top of the cornice to the top of the door is 66 feet 6 inches: the door is 20 feet high. The four human figures with which it is decorated are most gigantic, as will appear from the following dimensions: from the shoulder to the elbow 15 feet 6 inches; the ears 3 feet 6 inches; the face 7 feet; the beard 5 feet 6 inches; the entire height to the top of the cap, which is 12 feet, 64 feet.

Over the door there is a colossal figure of Osiris, 20 feet high, with an equally colossal hieroglyphic on each side. On the top of the temple is a cornice with hieroglyphics.

Having considered the original type of Egyptian architecture as existing in the tombs of that extraordinary people, we may now proceed to examine the form, arrangement, and parts of one of their great temples, such as those found at Thebes.

The temples were generally situated on or near the banks of the Nile, or when placed at any distance from the river were connected with it by an ample avenue or causeway, which led to the sacred edifice. This was called a dromos, and was frequently lined on each side by sphinxes. These are conventional figures, composed of the body of a lion with the head of a man, or a female, or a ram. The fore claws, instead of being those of a lion, were sometimes human hands; the hind legs occasionally those of a goat. The avenue at Carnak consists of sphinxes with the ram's head surmounted by the cap of dignity, and a kind of mummy figure stands erect between the fore legs and immediately under the chin. These sphinxes were carved out of stone and painted, the face being red, and the main with alternate stripes of yellow, blue, and red. This dromos was 63 feet wide, the sphinxes about 18 feet long and 12 feet apart, and, as the avenue was about 3000 feet long, there must have been 120 sphinxes to line the way on each side. But they are not all of the same character, but vary in the heads and extremities. The larger sphinxes were carved out of sandstone or limestone, but some have been found formed of granite and basalt, and at Heliopolis there are the ruins of a sphinx of bright spangling yellow marble, 22 feet long. But the most remarkable Egyptian sphinx is that which stands on the same plateau as the pyramids of Gizeh, supposed, by Belzoni, to be of equal antiquity. The head and neck rise above the sand of the desert in which the rest of the body still lies buried. Various travellers have at different times cleared away the sand, so as to bring parts into view. It has the usual lion's body with the head of a man. The whole length of the figure was 143 feet, the circumference round the head 102 feet, from the chin to the top of the head is about 28 feet. The body is cut ont of the rock; but the fore paws, which are about 50 feet long, were constructed of masonry. The whole was originally covered with a coat of plaster and then painted, first with a general tint of yellow as usual, and the parts varied with red and blue. The face and neck had the usual brick red colour common to all statues, representing the natural flesh colour of the Egyptians in all their paintings. Abdullatif, an Arab writer, who wrote a long time ago a description of the antiquities of Egypt, saw a great portion of the colour still remaining, and expresses his admiration of the effect.

There is nothing in the writings of ancient authors, or in the existing Egyptian monuments, to enable us to determine the origin of these monstrous forms. They are doubtless mixed up with the inexplicable mysticism of Egyptian worship, and probably were meant to embody some of the peculiar attributes supposed to be possessed by their creature gods. The expression of the countenance, whether of a ram or of a human face, is always benignant and calm, indicating a state of repose and dignity.

The introduction of colossal statues was another remarkable feature of architectural decoration, and without which, it may be said, no entrance of any importance into an Egyptian edifice is complete. These colossi are either sitting or standing: in the former case they represent certain gods or deified kings; in the latter, deities, or persons of less consequence. The two largest and most complete are those among the ruins of Thebes, which rise from the sandy desert waste as two enormous and gigantic masses, and are seen at a distance of five leagues. The figures are represented as seated, with their arms resting as usual on their thighs. Hamilton, in his Egyptiaca, and other travellers, consider these statues 50 feet high, but Champollion states them to be 60 feet. Each statue is formed of a single block of brescia, from the quarries of the Upper Thebaid, and is placed upon an immense plinth of the same material. Each represents a Pharoah seated in an attitude of repose. Denon thought them to be two females, Egyptian princesses. The upper part of one of the statues was destroyed in ancient times, either by an earthquake or an enemy, but was repaired with great skill in the latter ages of the Egyptian Empire, with courses of stone hewn so as to complete the figure. A small figure of a female is placed on each side of these statues, and attached to the chairs; these measure 15 feet in height, and appear to represent Egyptian queens, one the mother of the king Tman-Hem-Va, the other the wife Taia of the same Pharoah.

When the traveller looks on these statues, and finds no propylon near, nor groups of columns to indicate the existence of a former building, he is led to suppose that they were erected independent of any such accompaniment. But modern researches have discovered in the heaps of sand behind the statues, fragments of shafts and capitals of columns.

Champollion Figeac sums up the historical incidents connected with these twin statues in the following words:—

"1. Two colossi formed part of the decoration of the magnificent edifice erected by king Amenophis, at Thebes.

2. These colossi, according to custom, represented the king himself, and bore his name.

3. They underwent, as did all other monuments of this country, the effects of time and foreign conquest.

4. An earthquake in the year 27 before Christ broke the northernmost of the two statues, and detached from it a considerable portion.

5. Some years afterwards, there was a report that sounds proceeded from the statue at sunrise, which attracted the attention of the world at that period.

6. At this period the statue was considered to be that of Memnon, son of Tiphon and Aurora, who saluted his mother with his masculine voice every day at sunrise.

7. This led to a religious veneration of the supposed divinity, and libations and sacrifices were offered to him.

8. The mutilated statue was restored by Septimius Severus, and the marvellous voice was no longer heard."

There are in the British Museum many fragments of colossal figures, and among them there is an arm ten feet long, belonging to the statue the head of which was brought over by Belzoni.

We must now proceed to make a few remarks upon Egyptian obelisks:—

Obelisks are the most simple monuments of Egyptian architecture, and they must be considered as the most interesting that antiquity has transmitted to us, whether considered in reference to the perfection of their execution, or the material which has rendered them so enduring; but above all they are remarkable for their prodigious masses and great antiquity. Imposing testimonials of the glory and power of the Pharoahs who erected them, these monuments reveal to us the arts and civilization of Egypt at an epoch when other people, scattered by chance over the face of the world, were plunged in darkness and barbarity. The most ancient of the most venerated of books, the Pentateuch of Moses, was not then written; Abraham was unborn; but even the inhabitant of Heliopolis adored his gods in the temple of the sun, and read upon the obelisk, still in its place, the name of Aroeris, and that of the king who erected it. At that time reigned Osortasen, a powerful Pharoah, whom fifteen royal dynasties had preceded, and who was to be followed by fifteen more, when Alexander the Great came to consult the oracle of Ammon, and to found a new capital for the empire at Alexandria.

The origin of obelisks is still unknown, but they are supposed to have been principally dedicated to the Sun, Aroeris, of whom the hawk was a symbol, on account of the elevation to which this bird extended its flight, and of the faculty which the ancients considered it to have of looking at the sun with a steady gaze. Pliny says, that the Egyptian term for an obelisk conveyed the idea of a solar ray, which its form was supposed to symbolise. The term obelisk is derived from the Greek word *obelos*, which meant a spit, a name which the witty Greeks gave them with a view, like all wits in such cases, to cover with an air of ridicule what they could not condemn by fair argument.

The obelisks were generally formed of granite. The largest were extracted from the quarries of Syene, and were of one block, called "monoliths." They were quadrangular prisms, which diminished upwards till about nine diameters high, and from that part they rapidly diminished to a point called a pyramidion. They were placed on a cubical block or die, a little larger than the square of the shaft, which sometimes also had steps under it. The die was sometimes engraved with hieroglyphics, and we have Greek inscriptions carved on them. Not much attention was paid to the form of the die, which was sometimes irregular in shape, but was generally narrower at the top than at the bottom. The face of each side of the obelisk was convex, a fact which shows the nice perception of effect which prevailed in the minds of the ancient Egyptians, as the light was thus much softer upon the surface, and the shades even were less crude. The faces were generally carved with hieroglyphics, variously arranged; at one time distributed over the shaft, at others in one, two, or three rows; sometimes they were left quite plain, but were then unfinished. These hieroglyphics generally consist of the royal

Mr DONALDSON'S DESIGN FOR THE RO

Nº 50 THE FIRST OF THE BE

Engraved by E. Ollivier

ROYAL EXCHANGE. 1839.

BEST CLASS.

titles, names, and surnames of the princes by whom they were erected, the names being contained within what is called a cartouche.

The two obelisks before the temple of Luxor, one of which has been removed to Paris, were not of the same dimensions, the one being about 86 feet high to the top of the pyramidion, and at the base about 9 feet wide; the other, now at Paris, 78 feet in height, and 8 feet 2 inches at the base. It is supposed that the difference in the height of these two pillars arose from the difficulty of executing two exactly of the same size without sacrificing a considerable portion of the height of one. In order to render the difference less apparent, the architect had placed them on dies of pedestals of different heights, so that the base of the shorter one was raised above that of the other half the difference of the height, and it was placed a little in advance of the other, to assist the delusion, and augment the apparent scale of the lesser obelisk by bringing it nearer the eye of the spectator.

The pyramidion of the Parisian obelisk was in a very rough state. It consists of a channel or fillet, and a surface setting back, the granite presenting a rough surface. There must have been something to cover this unsightly appearance. An Arab writer, Mohammed son of Abdarrahim, says, in a work intitled Tohfal Allabab, translated by De Sacey, that one of the obelisks of Pharoah, which was at Mataria near Cairo, fell down, and a great quantity of copper was taken from the top. Reference is also made by Kodhai to two obelisks in the city of Heliopolis, as being extremely wonderful. "On their summits are two pointed caps in copper;" and again, "this obelisk is square, formed of a single block, pointed at the top, which is a covering of copper as yellow as gold, above which is the figure of a man sitting in his chair, looking at the rising sun." From these paragraphs M. Hittorff is led to conclude, that the French obelisk had originally a bronze capping, gilt, which hid the rough, misshapen pyramidion.

NEW CHURCH, TORQUAY, DEVON.

TO THE EDITOR.

Devon, February 3, 1843.

SIR,

WITH the remarks made by one of your correspondents, in your last number, upon the Architectural Societies, I perfectly agree, and as a proof of the accuracy of the opinions he has expressed, I would call your attention to an advertisement which appeared last week in the Exeter Gazette. A new church is to be built at Torquay, and the designs are to "be submitted to the Committee of the Exeter Diocesan Architectural Society." A complete servile submission to this society was the condition annexed to a contribution of £2000, but as two clergymen, the most influential members of the church committee, are members of the society, the same course would, probably, have been adopted if the condition had not been enforced.

The Exeter Diocesan Architectural Society consists of about 144 members, 73 of whom are clergymen, including the bishop. This is a large body of quack architects in a county where there are not more than five or six professional men, one of whom is in the pay of the society. To contend with them is impossible, and their unjust and oppressive interference can only be curbed by the unanimous co-operation of the profession, and the censure of the public voice. If the clergy, who are the active members, performed their own duties as pastors and teachers, they would have far less time to attend to a profession they do not understand. They are jealous enough of any interference with what they acknowledge to be their own duties, and are forward enough to protect their own rights, but they have yet to learn what they teach—"do unto others as you would they should do unto you."

A professional man residing in Exeter was, a short time since, appointed to the office of architect to the society, and unless he should be excluded from the competition for the intended church at Torquay, —and this is not probable,—he is almost certain, from his constant communication with those who are to select the design, of being the successful competitor. This inducement to become a competitor is certainly not to be resisted, or he might otherwise, as an architect of great respectability, leave the chance to those unscrupulous persons whose portfolios are filled with designs ready for every occasion, without the slightest regard to conditions or cost, and who rarely execute their works within double the amount of their original estimates. There is no reason to suppose that the church committee contemplate an unfair competition—but, for my own part, I doubt the possibility of any other. In the present case every individual may enter upon it with perfect good faith, but as one man possesses advantages over another, the real merits of the designs, supposing the judges to be competent, cannot be determined.

If the architectural societies had been formed to advance the study of the art, they would have been as useful to the profession as to the public. But this object is not even contemplated. They are established to compel a servile imitation of the ancient Gothic architecture in all modern ecclesiastical structures, and as such, independent of all other motives, must be opposed by every man who values his art and his professional character.

I am, your obedient Servant,

AN ARCHITECT.

UNSUCCESSFUL COMPETITION DESIGNS.

THE system of competition adopted in this country is constantly developing the taste and genius of our times in sculpture, architecture, and construction, but of the numerous elegant designs so frequently produced there is not at present any record, except in the minute books of the corporations or societies who are daily soliciting the gratuitous services of our artists. This circumstance is the more to be regretted, as the buildings and works which are erected give too frequently an unfavourable view of the taste and knowledge of the age. To perpetuate the existence of these designs, and to give posterity an opportunity of deciding upon the relative merits of the present race of professional men, and of comparing what was done with what might have been done, we must have recourse to the art of engraving. One of the objects of an Architectural and an Engineering Journal, should be, we think, to aid in the perpetuation of these rejected designs, by which the present and future age will be able to decide from examination, rather than from partial historians. The increasing circulation of this work, and the assistance it is receiving from the professions, both at home and abroad, give us an opportunity of doing this to some extent. Without such a permanent record, a few years will be sufficient to erase from the mind of the public even the remembrance of the names of those who have competed for public works, and who, in many instances, have produced drawings which, as productions of genius, art, and science, have been far superior to those that have been successful. It will not perhaps be possible to do all that we may wish, or all that our subscribers may desire, but we will give every possible assistance to the publication of valuable unsuccessful designs, and our exertions shall only be limited by the unavoidable cost of such illustrations.

MR. DONALDSON'S DESIGN FOR THE ROYAL EXCHANGE.

We commence our series of unsuccessful designs with an engraving of Mr. Donaldson's elegant composition for the Royal Exchange. It is

not our intention to revive the question whether Mr. Donaldson received a just consideration of his merits from the Gresham Committee, for such a discussion would now be equally objectionable to the architect himself, and to the present Editor of this Journal. A mere statement of events is therefore all that we shall attempt, leaving the profession and the public to compare this and any other designs we may publish in our future Numbers with the building now in progress. The Gresham Committee, having received a large number of drawings in reply to their advertisement, appointed Sir Robert Smirke and Messrs. Hardwick and Gwilt to examine them, and to give their professional opinions upon their several merits. The three designs selected, were numbers 50, 46, and 27, and of the former Mr. Donaldson was the author. These were described by the architectural judges as "the best class of designs, possessing for magnificence and beauty great claims as works of art, exhibiting very great talent, and distinguished by grand architectural features." Of these three Mr. Donaldson's was preferred, but it was notwithstanding rejected without a premium, upon the sole ground, that in the best class of designs "attention to the cost had altogether been lost sight of, and that the excess would be very much indeed beyond the limit assigned" of £150,000.

Against this opinion of the architectural judges the authors of the first class of designs had just reason to complain, upon the implied mutual contract contained in the instructions to competitors,—"That if reasonable doubts should arise in the minds of the committee as to the practicability of carrying into execution the successful design for the amount of the estimated expense of the building, this committee shall be at liberty to call upon the party to give sufficient and satisfactory proof of the accuracy of the calculations, and to withhold the premium and reject the design unless such proof be furnished."

In consequence of a memorial presented to the Common Council of the City of London by Mr. Donaldson, founded on the condition already quoted, the question was again referred to the joint committee for the management of the estates of Sir Thomas Gresham, and on the 29th of November, 1839, that committee passed the following resolutions:—

"That it is the opinion of this committee that the designs, Nos. 50, 46, and 27, selected in the second class by the architects appointed by the committee, are the best and most splendid designs; and if the expense of erection do not exceed £150,000 (or any other sum which the committee may approve), that one of these designs be selected, after due consideration of the practicability of such design.

"That a copy of the preceding resolution be transmitted to Mr. G. Smith, and that it be referred to him to report as to the expense and rental of such buildings, with such alterations as may be deemed requisite after communication with the respective architects by whom they are designed, for making them durable edifices, and that he further report upon the eligibility of the said plans after such alterations as he may suggest with reference to the printed instructions to the architects as issued by this committee."

This reference to Mr. Smith was, to say the least of it, and without reflecting in any way upon that architect, extremely injudicious. Mr. Smith had prepared a design for the Exchange, but, as the architect of the Gresham committee, had not been allowed to enter upon the competition.

The result of Mr. Smith's examination was, that the design No. 50 would cost £159,337, and that in some one or more important particulars all the designs were essentially deficient. Upon the discussion of this report the Gresham committee proceeded to ballot for five architects for a new competition, with the author of No. 46, the authors of Nos. 50 and 27 being unjustly excluded. Of these five architects four refused, under the circumstances, to compete, and it was left between Mr. Tite and Mr. Cockerell, Mr. Smith being again excluded. The former was, as is well known, successful.

In tracing the history of this important and memorable competition, we have only, so far as No. 50 is concerned, to add, that in answer to Mr. Smith's Report, Mr. Donaldson replied, that he had submitted his drawing to Mr. Hunt, a gentleman whose practical acquaintance with the price of material and workmanship had been fully relied upon by the committee of the Houses of Parliament in respect to Mr. Barry's estimate for that building. This gentleman, with Mr. Donaldson, had entered minutely into the calculation of the cost of the design No. 50, and having made his estimate at prices higher than those at which public edifices of a similar character had been contracted for, found that it would not have exceeded the sum of £144,555, and upon this a reduction of £7,000 might have been made without impairing the stability, or materially detracting from the magnificence of the building.

MONUMENTAL BRASSES.

A Series of Monumental Brasses, extending from the Reign of Edward I. to that of Elizabeth. Parts 1 to 12. By J. G., and L. A. B. Waller. Pickering.

Illustrations of Monumental Brasses. Nos. 1 to 5. By the Cambridge Camden Society. Stevenson, Cambridge.

Till within the last few years little or no attention has been paid by artists to the monumental brasses which were once so numerous in the southern counties of England, and of which there are still many interesting specimens. Year after year their number has decreased from the carelessness and indifference of parochial authorities, and the foolish peculation of antiquaries, so that of those which were left at the time of the Reformation many have been entirely destroyed, and of those which remain, the greater number are more or less injured.

"The hand of rapine or fanaticism," says Cotman, "has robbed her (Norfolk) of by far the greater part of what she once possessed: every effigy in her cathedral church at Norfolk, every morsel of brass at Yarmouth is gone; nor is there a village church but bears the mark of the despoiler's violence. A portion of the mischief is to be traced as high as the Reformation: still more is ascribed to the mad fury of the Commonwealth; and what remained from these has in our own days been gradually disappearing: here from the ignorant stupidity of parish officers, there from the thievishness of workmen; but in too many instances, I am sorry to say, from the inconceivable folly of antiquaries themselves, who have been the cause of an immense number of sepulchral brasses, and a still greater quantity of stained glass, being stolen from the churches they illustrated and adorned. This work, however, still contains a selection from about 300 whole-length figures yet remaining, besides numerous busts. I ought to have said lately remaining, for in 1800 the chancel in Ingham was completely swept of all its beautiful memorials of the Stapleton family: they were sold as old metal."

"We have still remaining in Northamptonshire," says Mr. Hartshorn, "136 examples; the number of those originally existing cannot be computed at less than four times this number."

The subject, however, has now attracted attention, copies have been taken, and collections have been formed. The result of this increasing interest has been the publication of two works; in one of which, at least, we have all that can be required for the perpetuation of the remembrance of these interesting sepulchral remains.

As works of art the monumental brasses are worthy of attention; for they enable us to trace with great accuracy the progress of engraving and design, nor are they the less curious from the circumstance, that they prove engraving in metal to have had, like all other fine arts, its

origin in the desire to perpetuate the memory of the dead. As historical memorials these sculptured brasses are, therefore, nothing less important than as specimens of the arts of the middle ages, for they not only assist the genealogist in tracing families, but are frequently of more public interest from the connection of individuals with events of historical value. They must, also, be constantly referred to as the best memorials of costume, and may be frequently applied to the illustration of the early literature of the country.

There is also another point of view in which these monumental brasses are exceedingly valuable, and peculiarly so to our readers, we mean as guides in tracing the history of Gothic architecture. Upon many of the brasses the figures or effigies are represented under Gothic canopies, which are of course designed in the style peculiar to the period when the plates were engraved, and, in nearly all instances, that was done within a few months of the decease of those whose memory they were formed to perpetuate. Every one who has busied himself with such subjects knows how difficult it is to fix the date of peculiarities of style in ancient buildings, the documents required for such a purpose being in general wanting. Hence it becomes a matter of conjecture at first, but this conjecture, being strengthened by other writers, whether qualified or not is seldom a matter of consideration, is soon received as a fact, theories are built on it, and errors innumerable are introduced. In many doubtful questions connected with the architectural history of the middle ages, those monumental brasses which bear architectural designs as well as representations of persons will be found extremely useful.

The earliest brass of which there is any record, was that of Simon de Beauchamp, Earl of Bedford, who died before the year 1208, and was buried before the high altar in St. Paul's, Bedford. This brass, which is not now in existence, was bedded in marble, and bore the following inscription, "*De bello campo jacet hic sub marmore Simon fundator de Newenham.*" This proves that inscriptions were adopted from an early period, though on the plates now found in our churches legends are not common till the middle of the fourteenth century.

This new fashion, introduced from Flanders, seems to have been much admired by the rich and noble, and particularly by ecclesiastics, if we may judge from the number of brasses said to have been placed over tombs during the thirteenth century.

"Joscelyn, Bishop of Wells," says Cotman, "who died in 1242, had a brass in the choir there. Richard de Berking, abbot of Westminster, who died in 1246, had his figure in *pontificalibus*, and an inscription on the ledge in brass. Bishop Gravesend, 1279, had his figure inlaid with brass in Lincoln Cathedral. So was it also with Bishop Longespée, 1297, at Salisbury; and with Elias de Beckenham, 1298, at Botsford. 'Ela, countess of Warwick, a woman of very great riches and nobilitie, lyeth under a very fair, flat marble, in the habit of a woves (vowess or nun), graven in a copper plate,' says Leland, who speaks as an eye-witness. She died 1300.

"These authorities assign an early date to brass figures, and by the beginning of the 14th century they were become so common, that in 1308 a canon of Hereford could afford a very handsome one, 'though it is still the oldest sepulchral brass now entire and well preserved that I have seen,' says Gough."

The most ancient brass in England, as far as present researches extend, is that to Sir John D'Abernoun, about 1277, in Stoke D'Abernoun, Surrey, and is almost the only one belonging to the thirteenth century. The oldest in Norfolk, according to Cotman, is that to Sir Hugh Hastings, at Elsing, which is referred to the year 1347, and he does not seem to have discovered any records of one previous to that of Thomas de Cailey, rector of West Bradenham, who died between the years 1318 and 1328.

"The brass of Sir John D'Aubernoun," says Mr. Waller, "is the only example of the time of Edward I. that is not cross-legged, and if this attitude were assumed only for such as had served in the Holy Land, or were under a vow to do so, it follows that Sir John never devoted himself to that cause. He is entirely enveloped in a suit of interlaced chain mail; the body is covered by a haudberk with sleeves, a hood or coef de mailles is drawn over the head, and chausses protect the legs and feet; at the knees are genouillieres of plate ornamented with roses, and the spurs are of the plain pryck form. Over all is worn a loose surcoat with a fringed border; it is confined at the waist by a plated cord, below which it opens in front and falls on each side in ample folds. An enriched guige passing over the right shoulder supports on the opposite side a heater shield emblazoned with armorial bearings; the ornaments on the guige consist alternately of a rose and the cross, called the "fylfot." A broad belt slightly ornamented suspends the sword, the pommel of which is curiously worked with a cross in the centre; the scabbard is plain. A lance passes under the right arm, the shaft resting on the ground; immediately below the head is affixed a pennon, charged with the arms of its owner. The feet rest on a lion couchant, who holds the bottom of the lance between his paw, and grasps the staff with his teeth: the manner in which this is represented is extremely natural.

"Considered as a work of art, it will be found that the figure is ill-proportioned, but the arrangement of the drapery judiciously contrived, whilst, as a production of the burin, this brass is not excelled by any posterior example; each link of the mail is distinctly represented, and the mere work of graving up so large a surface must have cost many weeks of patient labour; it is much to be regretted that so interesting a monument is in a great measure concealed by the rails of the communion table, especially as a trifling alteration would lay open to view the first example that can now be referred to, of this imperishable and valuable class of monumental records."

The next brass in point of age, is that of Sir Roger de Trumpington, who died in 1289:

"The effigy," says Mr. Waller, "is inlaid on the upper slab of an altar tomb in Trumpington Church, occupying the space between one of the arches of the north aisle, and is surmounted by an elegant stone canopy; the inscription was engraved on a fillet of brass round the edge of the slab, but has long since been removed. The figure is represented in an attitude of repose, the hands conjoined over the breast, and the legs crossed; at the feet is a hound biting the edge of the sword. The head rests on a helm, which is large and conical, having at its apex a staple for affixing either a feather or a lady's scarf, called the 'kerchief of plesaunce;' the helm itself is attached by a chain to a narrow cord round the waist. The costume accords generally with the previous example of Sir John D'Aubernoun, about twelve years earlier, but is remarkable for the entire absence of ornament; we see, however, an addition to the defensive armour in the ailettes, or little wings, which are tied at the back of the shoulder to protect the neck; they were probably of steel, and appear to have been edged with fringe. The shield is large, and of the heater shape, but concave to the body, which well adapted it for protecting the person.

"It is evident at a glance that this brass was never finished: how it came to be left in an incomplete state, must now remain matter for conjecture; it was clearly intended that the heraldic portion should be inlaid with the appropriate colour, and a small portion of the shield was chiselled away for that purpose. The figure is well-proportioned, and the engraving bold and effective; but it is not equal in execution to the earlier monuments of Sir John D'Aubernoun, and still less that of Sir Robert de Bures."

The Trumpington brass is also represented and described by the Camden Society, and their description may be placed beside that of Mr. Waller:

"The plate of our hero shows him wearing the armilausa over his hauberk of mail. The head, covered by the coif-de-mailles, rests upon the beaume, which is attached by a chain to a narrow cingulum or girdle round the waist, an example unique in England, and probably in other countries. On the back of shoulders are ailettes, or little wings, charged with his arms. The shield on the left shoulder is sustained by a gigue, or narrow strap, and the sword, which diagonally crosses the body, by a broad belt. His chaucons of mail are covered at the knees by genouailles of plate, and he wears a simple pryck spur. As a work of early art, this monument is highly interesting, and, with the exception of a still richer one in Aston Church, Suffolk, the finest of the series. That of Bacon, at Gorleston, in Suffolk, is not, perhaps, so worthy of notice as a work of art, but must yet be considered extremely curious."

The Camden Society does not seem to have been aware of the existence of a brass to Sir John D'Aubernoun, for although in the essay on the Trumpington brass the author examines the military brasses in

general, he takes no notice of it, but treats of that to Sir Roger as though it were the most ancient.

To decide upon the relative merits of the two volumes from which we have quoted is by no means a difficult task, whether they are considered as works of art or of antiquarian research. The Camden Illustrations are any thing but what they are called, being in every respect defective, and conveying no idea of the relative artistic merits of the brasses of which they are supposed to be copies. There is also a want of uniformity in the representation of the subjects, for in some numbers they are lithographed in outline, and in others absurdly shaded, which renders them utterly worthless to the antiquary, who wants a drawing of the brass as it is, and not as the Camden Society thinks it ought to have been. It is indeed evident that the authors of the work, whoever they may be, have undertaken a task they feel themselves unable to perform, and, dissatisfied with their own arrangements, change the style of their lithography in almost every number. Conscious of the imperfections of the work, an attempt is made to save the character of the book by the introduction of subjects which make pleasing pictures, but which have nothing more to do with brasses than clergymen ought to have with the erection of the churches in which they are to officiate. Such a work is most disgraceful to such a Society, and the more so as it has prevented the publication of others which would have been valuable. One work, we know, upon the brasses of Kent, was entirely given up by its author, after spending years in preparation, under the fear that it would be useless for an individual to compete for public support with an influential, if not a rich society. The failure of an egotistical association that has assumed the right of placing its judgment beyond appeal is a matter of little importance to the public, while it may be of service to the Society itself; but it is of consequence that years of laborious research have been lost by an antiquary, and that the public has been deprived of a correct series of interesting works of art.

It is in every respect satisfactory to turn from the wretched failure of the Camden Society to the beautifully executed etchings of Messrs. Waller. These gentlemen have done all that art can do, and have produced a work which will be to them as noble a monument of honour as was ever desired by the most ambitious of those whom the brasses commemorate. They are all accurate copies of the originals, and are drawn to scale, generally about three inches to a foot. They are tinted by hand, and the heraldic colours are introduced where it can be done with certainty. Nor will the price be an impediment to those who wish to possess the work, for, as an illustrated volume, possessing so many claims upon the antiquary and architect, it is exceedingly cheap. The Camden Society has already announced its intention of republishing the first number of its series, in which, advantage will no doubt be taken of the excellent model offered by the Wallers, and the original subscribers will be proportionably injured by the depreciation of the work for which they have paid.

In the selection of the subjects Messrs. Waller have also been fortunate, by which they have shown themselves to be thoroughly acquainted with the existing remains. The descriptions are not less creditable, their researches being characterised by great acuteness in tracing the history of families, and a thorough knowledge of costume, which is by the work itself beautifully illustrated. It is seldom that we meet with a book of which we can speak with such unqualified praise, or which we can recommend to our readers with so much certainty of receiving their thanks for the introduction.

AN ACCOUNT OF THE RECLAIMING AND DRAINING OF LAND IN THE BEDFORD LEVEL, COMMONLY CALLED THE GREAT LEVEL OF THE FENS;

The nature of the soil; the direction of the tides, rivers, estuaries, &c.; the means that have been adopted for retarding or preventing the waste of lands; the reports that have been made by engineers and others; and a comparative statement of their different schemes.

BY HARDY WELLS, C. E. AND SURVEYOR.

[The introduction of this paper into our pages, renders it unnecessary to print at present those reports promised in our last number, as they will, with others, be necessarily inserted in the course of this historical view of the engineering works which come under the attention of the Author.—Ed.]

The boundary of the Bedford Level is determined by the act of Parliament passed in the 15th year of the reign of King Charles II., "for settling the drainage of the Great Level." The eastern, southern, and western sides of the Level are surrounded by lands in Norfolk, Suffolk, Cambridgeshire, Huntingdonshire, and Northamptonshire, which lie higher, and are not subject to inundation. The boundary of the Level on these sides, except in a few instances, is the outline of the Fens or marshes formerly subject to inundation. The appearance of the soil adjoining is altogether different from that of the land in the Level. Toward the north, the boundary line is by the Old Welland river to Great Porsand, and by the old South Eau, the banks of Waldersea and Coldham, the river Nene, and Well Creek. Holland, in Lincolnshire, and Marshland, in Norfolk, lying between the Bedford Level and the bay of the sea between Norfolk and Lincolnshire, is not included in the Great Level. The Bedford Level lies within the Isle of Ely, and counties of Norfolk, Suffolk, Cambridgeshire, Huntingdonshire, and Northamptonshire. In the Isle of Ely, it comprises the city of Ely, and towns and villages of Witchford, Wentworth, Thetford, Streatham, Wilburton, Haddenham, Sutton, Mepal, Witcham, Coveney, Manea, Downham, Littleport, Chatteris, Doddington, Benwick, Wimblington, Whittlesey, Thorney, and part of Wisbeach and Elm, Upwell, and Welney. In the county of Norfolk, parts of the following places: Denver, Hilgay, Southery, Roxham, Dereham, Wareham, Wretton, Stoke, Northwold, Methwold, Feltwell, and Hockwold-cum-Wilton. In the county of Suffolk, parts of Brandon, Lakenheath, and Mildenhall. In the county of Cambridge, parts of Fordham, Soham, Isleham, Wicken, Burwell, Reach, Swaffham, Bottisham, Horningsey, Waterbeach, Cottenham, Rampton, Willingham, and Over. In the county of Huntingdon, parts of Somersham, Warboys, Wistow, Berry, Ramsey, Upwood, Raveley, Woodwalton, Sawtry, Connington, Holme, Glatton, Denton, Caldecotte, Stilton, Yaxley, Farcet, and Standground. In the county of Northampton, part of Peterborough and Eye. In the county of Lincoln, part of Crowland and Sutton. The Fens which now constitute the Bedford Level, were surveyed by William Hayward, under the directions of the Commissioners of Sewers, and verified upon oath 14th June, 1606, to contain 312,668A. 1R. 30P. This relic is now amongst the documents of the Bedford Level corporation, at the Fen Office; it contains the separate admeasurement of the Fens in each place, it shows what land was then common, and what inclosed, and generally the situation and quantity of both the commons and the inclosures, with the name of the owner of the inclosures. Within the outline of the Bedford Level, are lands lying above the general surface of the Fens, which do not appear to have been subject to inundation. They were formerly islands surrounded

by waters and marshes, of which Ely stands as the largest and the most prominent. Littleport, Coveney, Manea, Chatteris, Doddington, with Wimblington and March, Whittlesea, Thorney, and Crowland, were also separate islands, with other smaller ones. Except these lands, the whole of the surface of the Fen of the Bedford Level consists of moor and alluvial soil; moor in every state of decomposition, from the roots of the aquatic plants, almost as they grew, of the colour of ochre, to a rich, dark, pliable loam; from the most compact hard moor to the roots and remains of vegetable matter, so loose that a dike cut into it is almost immediately filled by the moor from the side or the bottom. In some places, the upper strata of the moor are firm, whilst the lower strata are quite soft. In other places, occur strata of moor and of silt and ouze (which is a sort of miry sedge), and frequently moor underneath the strata, both of silt and ouze.

It may be very safely conjectured, from the facts and observations which I shall detail, that the Fens of the Bedford Level were marshy and impassable whilst the Romans were in possession of Great Britain, and that the parts of Marshland in Norfolk, and Holland in Lincolnshire, which are now much above the surface of the Fens between the Level and the sea, were formed before that time. The whole of Marshland and Holland consists of alluvial soil, and the same operations of the waters of the sea which occasioned these accumulations, have obstructed the passage of the waters of the Fens, and of the rivers passing through them. The accumulation of alluvial soils, and of silt or sand in the mouths of the rivers, and in the great estuary or bay which lies between Norfolk and Lincolnshire, have held up the waters, and occasioned the continuance of the marshes and Fens, but they were not the original causes of their being in that state. Moor is found in every part of the Bedford Level, and also under the highest part of Marshland, where it is covered by similar strata of sea sand or ouze of the most compact nature; and I have been assured by professional gentlemen who have been employed to make observations upon the nature of the soil, that there is a stratum of moor under the sands in the bay of the sea adjoining. From these facts it will appear that this moor was formed antecedent to the accumulation of the land of Marshland and Holland, and it may be safely inferred that the same accumulation would very considerably obstruct the ancient passages of the waters of the Fens to the sea. The moor under the sands in the bay appears to be of the same character as the moor of the Bedford Level, and I apprehend it is not an unnatural conjecture that it had its growth in fresh water, and that the water of the sea, at the time the moor was formed, did not overflow it. I will now proceed to state, upon the authority of an accurate writer, what the Bedford Level originally was.

"This vast level," says Sir Wm. Dugdale, "was at first firm dry land, and not annoyed with any extraordinary inundation from the sea or stagnation of the fresh waters, which may perhaps seem strange to many; but when it is well considered that timber trees will not grow and thrive where water, for the most part, stands; or in moor, which by tract of time is bred and increased in such moist places, both the one and the other may, with much probability, be granted. The case being, then, thus stated, it now remains for me to prove, that such have heretofore been bred and prospered in sundry parts of this now fenny country, which is no hard matter to do, divers persons, yet living, being able to testify, that in the late digging of those channels and drains, as have been made for the excavation thereof, great number of such trees, of several kinds, have been found, most of oak and fir, and few of them severed from the roots; but of such as to be so severed, the roots are observed to stand in the firm earth, below the moor, of which sort I myself have seen some that were taken up in the Fens near Thorney, and have had creditable information of multitudes found in other places, whereof some were digged up at the cutting of that large channel called Downham Eau, which extendeth itself from Salters Lode, about four miles northwards, towards Lynn. Moreover, in Marshland, about a mile westward from Magdalen bridge, at the setting down of a sluice, very lately, there was discovered at seventeen feet deep divers fuʳze bushes, as also nut trees, pressed flat down, with nuts sound and firm lying by them; the bushes and trees standing in solid earth, below the silt, which hath been brought up by the inundations of the sea, and in time raised to that great thickness.

As Sir William Dugdale was not personally interested in the prosperity of the Fens, and as he is allowed to be a most correct historian, some confidence may be placed in his statements. He was the only son of John Dugdale, of Shustoke, near Coleshill, in the county of Warwick, by Elizabeth, his wife, daughter of Arthur Swynfen, a younger son to William Swynfen, in the county of Stafford, Esq., and born at Shustoke, the 12th September, 1605; he was created Chester Herald in the room of Edward Walker, Esq., on the 16th April, 1644; was made king at arms 18th June, 1660, after the death of Sir Henry St. George, Kt. He received the honour of knighthood on the 25th May, 1677, and died on the 10th February, 1685.

It is not necessary for me to make any other quotation to show that this was originally a woody country, or rather that it was in such a state that trees would grow in it. I shall now endeavour to suggest the circumstances which caused the inundation of this large tract of country. That I have not been able to glean any direct information, from the researches I have made, as to the actual cause of the change, I do not feel any diffidence in admitting, for I find that Dugdale, in his History of the Great Level, says, "But when and by what means that violent breach and inundation of the sea was first made into this country, I am not able positively to affirm: therefore I must take leave to deliver my conjecture therein, from the most rational probabilities, which is, that it was from some great earthquake; for that such dreadful accidents have occasioned the like, we have unquestionable testimony. In the time of Valentinian and Valens, A. D. 368, there was an earthquake, which not only overthrew divers cities, but altered the very bounds of the sea; which so flowed in some parts, that men might sail in those places where before they did walk, and forsook others, that they became dry land." Mr. Watson, however, in his History of Wisbeach, says, he is unwilling to attribute the change to any such cause, having no recorded account that this happy island has ever been considerably affected by any extraordinary convulsion of nature. I am certainly inclined to his opinion, for the earthquake of which I have given an account happened in 368, and we find that in the time of William of Malmesbury the country was in a fruitful state. I am therefore disposed to attribute the inundation to other and more ordinary causes, though perhaps they may have been assisted by some extraordinary phenomena. It is not improbable that the change may have been occasioned by a severe winter, when the banks of the rivers being broken, an inundation would be produced. Such a storm as that in the pine forests of North America, would have effected singular physical alterations in a flat country like the Bedford Level.

"A heavy fall of snow had been succeeded by a partial thaw, and rain followed by a severe frost, which enveloped the trees and earth in a thick coating of transparent ice. The following morning, the accumulation of ice on the branches of the forest trees presented a beautiful and extraordinary spectacle. The noblest timbers were everywhere to be seen bending beneath the enormous load of ice with which their branches were encrusted, and of the heavy icicles which thickly depended from every point, the thickness of the ice, even on the spray, often exceeding an inch. The smaller trees, from 20 to even 50 feet in height, were bent to the ground by this unwonted burden, and lay pressing on one another, resembling fields of corn beaten down by a tempest. Above the taller trees drooped their branches, glittering as if formed of solid crystal, and with the slightest breath of wind clashing each other, and sending down showers of ice. The following day, the limbs of the trees began to give way beneath their load; the leafy spray of the hemlock spruce was thickly encased, and hung drooping round the trunks upon the long pliant branches, until the trees appeared to be solid masses or monu-

mental pillars of ice. Everywhere around was heard the crashing of the branches of the loftiest trees of the forest, which fell to the earth with a noise like the breaking of glass, yet so loud as to make the woods rebound. As the day advanced, instead of branches, whole trees began to fall, and during twenty-four hours, the scene which took place was as sublime as can well be conceived. The whole forest seemed in motion, falling, wasting, or crumbling, as it were, by piecemeal. Crash succeeded crash, until at length these became so rapidly continuous as to resemble the incessant discharges of artillery gradually increasing, as from the irregular firing at intervals of the outposts, to the uninterrupted roar of a heavy cannonade. Pines of 150 and 180 feet in height came thundering to the ground, carrying others before them. Under every tree was a rapidly accumulating relic of displaced limbs and branches, their weight increased ten-fold by the ice, and crushing everything in their fall with sudden and terrific violence. Altogether this spectacle was one of indescribable grandeur. The roar, the cracking and rending, the thundering fall of the uprooted trees; the startling unusual sounds and sights produced by the descent of such masses of solid ice, and the suddenness of the crash when a neighbouring tree gave way, were awful in the extreme."

Though we have no record of such an event as that just referred to, one of a similar nature may have occurred, and would certainly have left the Fens in the state they were when the first attempt was made to drain them. As frequent discussions have taken place respecting the deposit of silt and other alluvial matter of which the ground is composed, I will here introduce an extract from "Kirby's Suffolk Traveller," giving an account of a sand-flood in the Fens, which caused a great deposit upon the land, and would, if accompanied by a flood, have effected a material and permanent change in its surface:

"The circumstances of a sand flood, which happened at Downham in the year 1668, are related at large in the following letter, written by Thomas Wright, Esq., then living upon the spot, and a great sufferer by it, in which he says 'he found some difficulty in tracing these wonderful sands to their original, but he found it to be in Lakenheath, a town about five miles south-west of Downham, where some great sandhills, having the superficies broken by the tempestuous south-west wind, were blown upon some neighbouring ground; this being of the same nature, and having only a thin coat of unthrifty grass over it, by the other sand lying on it, increased to a mass, and accompanied its strange progress.' Mr. Wright supposes, that at the first eruption the sand did not cover more than eight or ten acres of ground, but before it had travelled four miles from its first abode, it increased so much that it covered more than a thousand. All the opposition it met with from Lakenheath to Downham, was from one farm-house, which the owner endeavoured to secure by building bulwarks against it, but perceiving this would not answer his purpose, he changed his plan, and, instead of trying to prevent its approach, he slighted all his works, and every fence which might obstruct its course, and thus, by giving it free passage, in four or five years time he was fairly rid of it. It was about thirty or forty years before the writing of this account that the sand first reached Downham, where it continued for ten or twelve years in the outskirts of the town, without doing any considerable damage, the reason of which (as Mr. W. imagined,) was, because its current was down-hill, which sheltered it from those winds which gave it motion, but the valley being once passed, it went above a mile up hill in two months time, and overran above two thousand acres of very good corn land the same year. It now got into the body of this little town, where it buried and destroyed divers houses, and forced them to preserve the remainder at a greater expense than they were worth. He at last gave the flood of sand some check, though for four or five years his success was doubtful. It had possessed all his avenues, so that there was no passage to him but over two walls that were eight or nine feet high, and encompassed a small grove before his house, then almost buried in sand. Nay, at one time it had possessed his yard, and was blown up almost to the eves of his outhouses. At the other hand, it had broken his garden wall, and stopped all passage that way. In four or five years Mr. Wright stopped it, as well as he could, with furze hedges, set upon one another as fast as the sand levelled them, which he found to be the best expedient. By this means he raised sand banks near twenty yards high, and brought the sand into the compass of eight or ten acres; then, by laying some hundreds of loads of muck and earth upon it, in one year he reduced it again to 'terra firma,' and then he cleared all his walks, and by the assistance of neighbours, who helped him away with one thousand five hundred loads in one month, he cut a passage to his house through the main body of the sand. But the other end of the town met with a worse fate, where many houses were overthrown or buried, and their pastures and meadows, which for so small a town were considerable, were overrun and destroyed. That branch of the Little Ouse on which this town borders, better known by the name of Brandon, or Thetford river, for three miles together was so filled with sand, that a vessel with two loads weight passed with as much difficulty as before a vessel with ten, and had not this river interposed, and stopped the progress of the sand into Norfolk, great part of that country had been ruined. For (as Mr. W. observes), according to the proportion of the increase of the sand in these five miles, which was from ten acres to one thousand five hundred or two thousand, in a progress over ten miles more of the like soil, it would have been swelled to a huge and amazing quantity.

"Mr. Wright imputes the cause of this flood to the violence of the south-west wind passing over the level of the Fen without any check, and to the sandiness of the soil."

Having suggested some causes which may have produced the inundation of the Fens, I shall now proceed to inquire by] whom this land was first secured from the sea, and also the means adopted for so securing it. As no certain information can be obtained of the time when such works were commenced, it may be inferred that it was at a very early period. It has been generally supposed that the Romans were thus engaged, and it is probable that it afforded means of employment to some of the numerous soldiers whom they kept in their pay. The Britons being a people averse to enterprize, and unskilled in the arts and sciences, we may readily come to the conclusion that they made little effort to improve the country. As this tract of land was not thickly wooded, it would be subdued by the Romans with comparative ease, and they would probably be induced to bestow early attention on the means of protecting it from the destructive effects of the floods to which it was subject. Tacitus, in his Life of Agricola, says, that "the Romans are said to have been employed in clearing the woods and draining the marshes," and the number of Roman relics found in these parts give additional confirmation to this opinion, as well as the Roman causeways, the most remarkable of which is that extending from Denver in Norfolk (near Salter's Lode) over the Wash, then to March, Plautwater, Eldernell, and Peterborough, in length 24 miles. Herodian, in the Life of Severus, makes the following remark:—"He therefore first took care to make causeways over the Fens, that his solders might stand on firm ground, and with ease passing over them, fight on the dry land; there being many places fenny by reason of the frequent inundations of the sea, over which the barbarous people did swim."

The Romans continued in possession of the Fens until the 5th century, when they finally abandoned this Island, about the year 448. On the invasion of the Saxons, one company under Uffa seized upon the counties of Cambridge, Suffolk, Norfolk, and the Isle of Ely, and their leader assumed the sovereignty thereof, under the title of King of the East Angles. It has been stated that the Saxons first commenced the drainage of the Marshland in Norfolk, which comprises a great portion of this Fen; but it is more probable that Nature performed the chief part of this great work, by the sandy deposits which the floods left behind them, which deposits, in course of time, rose above the level of high water, thereby gaining ground on the sea. The Romans, who lost no opportunity of improving the countries subject to their sway, finding the soil thus raised above the usual tides exceedingly rich and fertile, bestowed great pains and cost in constructing strong banks of earth to defend it from the tides, by which means both Holland and Marshland were gained.

St. Guthlac, who lived about A. D. 700, describes the Great Level as being turned into a wilderness of flags and sedge from its neglected state; and there is no doubt that the waters being interrupted in their passage to the outfalls, the rivers would gradually silt up, for want of a proper supply of back-water to scour them, and thereby afford very insufficient means of drainage. From this time, it is

supposed, this valuable tract of country lay for many years in a desolate condition. It is probable that on the establishment of the kingdom of Mercia, which comprised Huntingdon, Lincoln, and fifteen other counties, the inhabitants began to turn their minds to improvements, and among others, the repair of the long-neglected embankments. Dugdale, speaking of the Fens, says, "Our ancestors the Saxons, observing the extraordinary fertility of the soil, seated themselves in this country." The survey taken by William the Conqueror shows that the present towns all existed in the time of Edward the Confessor, and probably many years before.

Having thus shown that this great undertaking was commenced by the Romans, and continued by the Saxons, I must now draw attention to the rivers which pass through the Fens.

The two principal rivers which take their course through the Bedford Level to the sea are the Ouse and the Nene. The waters of the Ouse descend from parts of Oxfordshire, Buckinghamshire, and Northamptonshire, from the whole of Bedfordshire, and from a great part of Huntingdonshire, passing the towns of Buckingham, Newport Pagnel, Bedford, St. Neot's, Godmanchester, Huntingdon, St. Ives, Ely, Downham Market, and Lynn, and enter the bay now called the Great Wash, and by a company of noble and patriotic individuals associated for reclaiming a great part of this Wash from the sea, "the Victoria County." It appears from Badeslade's History of the Navigation of King's Lynn and Cambridge, that this river takes its rise 160 miles from its influx into the sea, and that its course is longer than that of the Humber, as long as that of the Severn, and within ten miles of the length of the Thames. When the Ouse reaches the Bedford Level, the following rivers unite with it: the Granta or Cam, at Harrimeer, below Streatham in the Isle of Ely, which receives the drainage of part of Essex, Hertfordshire, and all the upper part of the county of Cambridge; the Lark or Mildenhall river, which conveys the waters of part of the county of Suffolk, and unites with the Ouse at Prickwillow, near Ely; the Little Ouse, which joins the Ouse between Littleport and Southery, at a place formerly called Priest Houses; and the Wissey or Stoke river, which joins the Ouse a short distance below Denver Sluice, both of which rivers receive the waters of part of the county of Norfolk.

The Nene rises in the upper part of Northamptonshire, passing the towns of Northampton, Wellingborough, Thrapston, Oundle, Peterborough, and Wisbeach, and drains the principal part of that county to Peterboro', where it enters the Bedford Level. A little below this place is the course of the old river Nene, which passes through a sluice at Stanground into the Fens, where it receives the waters of part of the county of Huntingdon which do not flow into the Ouse. The waters of the Nene then descend by a channel called South Leam, made by the Bedford Level Corporation, from Peterborough to Guyhirn, and from thence by Wisbeach to the sea.

The Welland formerly discharged a part of its water through the Bedford Level, its bank constituting a part of the northern boundary of the Level, but passes now to its outfall through Spalding.

When the Ouse reached the Fens at Erith it divided, one branch extending eastward by Haddenham and Streatham to Ely, and another, which has now become land, called the "West Water," passing westward by Chatteris to Benwick, where it joined the old course of the river Nene. When the eastward branch of the Ouse reached Littleport it divided again, one branch going forward by Priest Houses, Southery, Downham, Wiggenhall, and Lynn, to the sea; and the other branch turning westward to Littleport, Welney, and Well, called the Wellen Eau, or the Old Welney River, where it was joined by the old course of the Nene, and from whence it descended to Wisbeach, and thence to the sea; but the waters of the river Nene now pass through Popham's Eau and part of Well Creek, through Salter's Lode Sluice into the Ouse, and so to the outfall at Lynn. In time of flood or emergency part of the water goes through the sluice at Nordelph into the Tongs drain, and has its outfall into the Ouse by a passage through the Tongs sluice. The water of the Ouse, at the present time, upon its reaching the Bedford Level, divides itself into three branches, viz: the West River (as I have described), which runs through the Hermitage sluice; the Hundred Foot, which runs without any impediment to the sea; and the Old Bedford River, part of which falls into the Hundred Foot River at Welmoor Sluice. The other part of the Old Bedford has its outfall into the Ouse through the Old Bedford Sluice.

It has been conjectured that the ancient course of the Ouse was altogether by Littleport. It appears from the surveys, or rather views of the Levels, made previous to the undertaking for the general drainage, that by diverting the Great Ouse at Littleport, turning it from its ancient outfall at Wisbeach, and joining it to the Little Ouse at Rebeck, as the river and outfall at Wisbeach decayed, those at Lynn improved so rapidly, that from an inconsiderable sewer, six perches wide, it had in the time of Edward the First become a considerable port with a capacious haven, and so great was the force of the tides received into it that the country could scarcely make any banks sufficient to resist their force, but were under the necessity of setting the banks back to a greater distance. In the year 1336 it was in some places a mile wide, such had been the force of the tides and highland waters acting in conjunction with each other; and by the like power it is, that the channels and outfalls of all the principal rivers in this island are maintained and kept open. The effects of cutting the connecting river from the Great Ouse to the Little Ouse is told in very few words; it increased the channel to the sea by Lynn, and gave that place the importance of which it is now possessed; but turning the waters of the Nene as well as the Ouse into that direction was fatal to the navigation and outfall at Wisbeach, for as the highland waters were diverted from that channel, it became gradually silted up, whence arose the most disastrous consequences by breaches of banks and inundations, from which the country even to this day is not free.

The course of the Ouse between St. German's bridge and Lynn, better known as the locality of the Eau Brink Cut, has undergone great changes, as the following circumstances will show. In 1329 it was presented by a Commission of Sewers, that "quays" were necessary for the protection of Tylney and Islington; and a similar presentment was made in 1336. In 1348 a Commission was issued to William de Thorpe, John de Walter, and Robert Petygand, to inquire into the state of the river, and it was found by a jury, that in the year 1338 there were destroyed by the raging of the sea in Wiggenhall ten messuages and 100 acres of land, and that by reason of the lands and tenements lying on both sides of that arm of the sea, the inhabitants had six miles of bank on one side and three on the other to maintain; and that in Tylney, in the same year, seven messuages and 70 acres of land belonging to the men of Tylney were lost for ever. In 1379 a petition was presented to the king, complaining that the water, by reason of its extraordinary breadth after the banks on one side thereof were worn away, had so great a "power on the bank on the other side, that all the towns in those parts were frequently overflowed," and a commission under the authority of parliament was directed to William de Uffard, Earl of Suffolk, Robert de Willoughby, William de Wychington, and John de Hawe, to inquire into the complaints contained in the said petition; and the said justices sitting

at Wiggenhall, it was found by a jury, that the banks on each side of the river running up from the main sea through the middle of the towns of Tylney, Islington, Wiggenhall, Watlington, to Runcan and Holme, and further even to Podike, were, through the extraordinary raging of the sea, so miserably broken and worn, that there was no remedy but the reducing of the said river within narrower bounds; and they said, that such a constraint thereof might well and conveniently be done in a certain place called Sark's Hyrn, in South Lynn, in this manner, viz.: "That whereas the said river did in that place then contain itself 40 perches in breadth, every perch being reckoned at 16 feet, it ought of necessity in that place to be restrained on both sides 24 perches, so that the breadth of the channel of the same river be reduced to 16 perches."

The width of the river Ouse between St. German's Bridge and Lynn continued a cause of complaint in the reign of queen Elizabeth and king James. In 1619 the inhabitants of Marshland presented a petition to the privy council on the subject, whereupon a reference was made to two Commissioners of Sewers, Mr. Henry Kervil, and Mr. Robert Balam, who viewed, and certified that the channel of fresh water did great hurt to Terrington and the whole of Marshland.

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(*To be continued.*)

ANALYSED ABSTRACT OF THE WORKING EXPENSES OF FOUR ENGLISH RAILWAYS,

DIFFERING GREATLY IN TRAFFIC AND GRADIENT, PER MILE, PER TRAIN. (*From a Correspondent.*)

HEADS OF EXPENDITURE.	LONDON AND BRIGHTON.*	NORTH UNION.†	LONDON AND GREENWICH.‡	SHEFFIELD AND MANCHESTER.§	Average of a number of the Railways in the United Kingdom.
	Pence	Pence	Pence	Pence	Pence
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Total Locomotive Power	(Cost of Coke 6½*d.*) 17	(Coke 36 lb. Cost 3½*d.*) 10	(Coke 20 lb. Cost 4*d.*) 11	(Coke 30 lb. Cost 2½*d.*) 11	
Carriages	3½	5¾	3	2½	4
Maintenance of Railway and Works	2½	7½	3½	3½	8
Conducting Traffic, Police, &c. ..	26	5	5½	5	7
Government Duty and Local Taxes	3½	7¾	10¼	8	8
Miscellaneous Expenses and Management	20	3	7	6	5
Total Periodical Working Expenses per Mile per Train ..	72 Pence	39 Pence	40 Pence	36 Pence	48 Pence

* Fifty-six miles, including a branch; general gradients 1 in 264, miles 1 in 100; 260,000 miles run by trains yearly; large passenger traffic, and van goods; merchandize and coal not yet considerable.

† Twenty-five miles, including a branch; general gradients 1 in 330, one-fourth distance 1 in 100; 140,000 miles run by all trains yearly, and 160,000 passengers carried, besides merchandize and coal traffic, which is great.

‡ Three and three-quarter miles, horizontal throughout; 170,000 miles run by trains yearly; 1,600,000 passengers carried, besides those from toll only.

§ Eight miles (only so far as opened); average gradient 1 in 132 several of 1 in 100; 60,000 miles run by trains yearly; great passenger traffic, chiefly of the lowest class; at present no other traffic.

THE CROTON AQUEDUCT WATER WORKS, NEW YORK.

BY W. B. FRITCHARD, ESQ., C. E. (FROM THE AUTHOR.)

THIS noble work was commenced in 1835, and has cost about 7,606,214 dollars. The whole line is divided into 101 sections, generally half-a-mile long. The first is Croton dam, by which Croton water is collected. The embankment is 250 feet long, 65 high, and 45 wide at the top, and is made of hydraulic stone masonry. The beautiful sheet of water thus formed has been named Croton River Lake, to distinguish it from the artificial reservoirs; it covers 400 acres of land, and will contain 600,000,000 gallons. This will allow a discharge of 35,000,000 gallons every day.

In a distance of thirty-five miles through Westchester county are passed an arch bridge of 80 feet, twelve tunnels or excavations under ground for the aqueduct (the aggregate length of which is 4,406 feet), thirty-two ventilators, and four waste weirs for the discharge of surplus water; and all are finished at an expence of about four million dollars. At section eighty-six, the aqueduct crosses the Harlem river; here a bridge is now building, which is indeed a Herculean task, requiring more engineering skill and watchfulness than any part of the whole line. It will consist of seven arches over land of 50 feet span, with eight arches over water of 80 feet span, and when finished will nearly equal any specimen of art in the world. Its cost is estimated at a million dollars, and its elevation is so great as not to impede the navigation of the stream, thus taking care of posterity and the wants of the metropolis when it shall extend to the Harlem river. Some idea of this vast undertaking may be formed from the fact, that the excavation for one pier has been carried 34 feet below the surface of the water, and then, a rock foundation not having been reached, 240 piles from thirty to forty feet long were driven for the purpose. Several piers have been already carried by aid of coffer-dams from four to fifteen feet above high-water mark.

Nearer the city there are more than 12,000 feet of tunnels cut through rock for two lines of iron pipes, 36 inches in diameter. Section ninety-six embraces the receiving reservoir at Yorkville, an immense structure, covering a surface of thirty-two acres, resembling an inland lake, and containing 158,000,000 gallons. The walls and embankments are of the most massive and durable construction, and the whole is enclosed by an elegant iron railing. The next two miles form the connecting link with the distributing reservoir on Murray's hill. This is a beautiful spot, and an admirable piece of workmanship, of solid granite, in form square, but much smaller than the other reservoir. Around its elevation summit, 115 feet above mean tide and 31 above surface, is a noble and broad walk, affording a most extensive view of the city, the Hudson, and the surrounding country.

The work south of the distributing reservoir consists in laying pipes to supply the lower part of the city with water. More than 100 miles of these subterranean streams have been finished, and 30 more are yet to be added. Splendid fountains will be built in the principal squares and public places, furnishing a supply of water to the poor, and, at the same time, they will be highly ornamental to the city. Those at Union square and the park are now in operation; the basin of the latter forms a circle 100 feet in diameter, with a turf bank, and the jets rise to a height of 55 feet. The former has a basin 60 feet in diameter, and three feet deep, with various jets 60 feet high, the most imposing of which presents the form of a wheat sheaf, resembling one in the court of the Palais Royal at Paris.

The whole length of the aqueduct is 41 miles; its foundation is stone, and a bed of "beton" made of broken stones and hydraulic terras; the sides are of hammered stones, and the floor an inverted arch eight inches thick. The upper arch is of the same construction. On the 8th of last June the superintendent went through the aqueduct on foot, and found the whole complete: on the 22nd the water was admitted to the depth of eighteen inches. The "Croton Maid," a small boat made for the purpose, and holding four persons, was then placed in the aqueduct, and its entire length was navigated by some of the party, to whom I am indebted for my information. This novel voyage was made sometimes at 70 feet below, and then at 80 feet above, the natural surface of the earth, at the rate of one mile in 40 minutes, which is the velocity of the current.

On the 27th of June the water was admitted into the immense receiving reservoir in the presence of a large assemblage of persons, including the mayor, governor, military, firemen, &c.; and the water has since continued to flow about two feet deep through the aqueduct, delivering into the receiving reservoir 12,000,000 imperial gallons per day, without any defect, and at a cost to each family of 10 dollars per annum for the supply. Its own force carries the stream into the highest stories of the most elevated buildings.

The names of M. Douglas, and his successor, John B. Jarvis, Esq., the engineers, will be connected with Croton Aqueduct as long as it endures; and the Americans may well call it the wonder of the "New World."

Shoreham, Feb. 8, 1843. M.

THE ATMOSPHERIC RAILWAY.

ABSTRACT OF A LECTURE DELIVERED IN THE ATHENÆUM OF MANCHESTER, BEFORE THE BRITISH ASSOCIATION, ON THE 27TH OF JUNE, 1842. BY CHARLES VIGNOLES, CIVIL ENGINEER, F.R.A.S., M.R.I.A., M. INST. C.E., AND PROFESSOR OF ENGINEERING IN UNIVERSITY COLLEGE, LONDON.

The system of producing motion on railways by means of the pressure of the atmosphere, had acquired the popular designation of the "*Atmospheric Railway;*" and it was the growing interest felt in the public mind for this new application of one of the very simple powers of nature to the uses of man, which had led the Council of the British Association to suggest the delivery of some public exposition of the principles on which it was based, and which had induced and perhaps justified the Professor in coming forward to attempt an illustration of the very ingenious contrivances which had brought these principles into practical effect. When the enormous cost hitherto incurred in the construction of railways was considered, as well as the heavy daily expenses in working these lines, it was not singular that efforts should have been directed to some means of producing similar useful results in a more economical manner.

A brief history of the discovery and gradual improvements of the first invention was gone into, tracing back the original thought to the celebrated *Papin;* in succession, long afterwards, came Lewis, Vallance, Medhurst, Pinkus, and lastly Clegg, all well known as active inquirers into this subject. But it was shown to have been *Medhurst*, who, about thirty years since, first gave to the world the right idea of connecting the body in the pipe or tube, directly acted upon by the atmospheric power, with a carriage moving along exteriorly; and that to one (already well known to science as the practical applier, economically and on a large scale, of gas for the illumination of large buildings and towns), viz. to *Clegg*, was due the merit of having worked out the suggestion of Medhurst to practical utility, in a way at once simple, efficient, and capable of enduring the rough usage necessarily attendant on constant and rapid motion.

Reference was then made to certain of the drawings and sections representing, drawn to the full size, an atmospheric apparatus equivalent in power to an ordinary locomotive engine, but occupying much less space. It is described to be a cast-iron pipe or tube of twelve inches in diameter, laid in lengths like water-pipes between the railway bars, and attached to the same cross-sleepers which supported them; on the upper part of this tube is a narrow longitudinal slot or opening, covered by a valve, the peculiar mode of opening and closing down and sealing whereof, constituted the ingenuity of the contrivance. The valve is a simple flap of leather, one edge of which is fastened down, so as to act as a hinge; the upper surface of the leather being plated in successive links with flat bar-iron, and the under surface also plated, but with links of a segmental form, to com-

at Wiggenhall, it was found by a jury, that the banks on each side of the river running up from the main sea through the middle of the towns of Tylney, Islington, Wiggenhall, Watlington, to Runcan and Holme, and further even to Podike, were, through the extraordinary raging of the sea, so miserably broken and worn, that there was no remedy but the reducing of the said river within narrower bounds; and they said, that such a constraint thereof might well and conveniently be done in a certain place called Sark's Hyrn, in South Lynn, in this manner, viz.: "That whereas the said river did in that place then contain itself 40 perches in breadth, every perch being reckoned at 16 feet, it ought of necessity in that place to be restrained on both sides 24 perches, so that the breadth of the channel of the same river be reduced to 16 perches."

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Miscellaneous Expenses and Management	20	3	7	6	5
Total Periodical Working Expenses per Mile per Train ..	72 Pence	39 Pence	40 Pence	36 Pence	48 Pence

* Fifty-six miles, including a branch; general gradients 1 in 264, miles 1 in 100; 260,000 miles run by trains yearly; large passenger traffic, and van goods; merchandize and coal not yet considerable.

† Twenty-five miles, including a branch; general gradients 1 in 330, one-fourth distance 1 in 100; 140,000 miles run by all trains yearly, and 160,000 passengers carried, besides merchandize and coal traffic, which is great.

‡ Three and three-quarter miles, horizontal throughout; 170,000 miles run by trains yearly; 1,600,000 passengers carried, besides those from toll only.

§ Eight miles (only so far as opened); average gradient 1 in 132 several of 1 in 100; 60,000 miles run by trains yearly; great passenger traffic, chiefly of the lowest class; at present no other traffic.

THE CROTON AQUEDUCT WATER WORKS, NEW YORK.

BY W. B. PRITCHARD, ESQ., C. E. (FROM THE AUTHOR.)

THIS noble work was commenced in 1835, and has cost about 7,606,214 dollars. The whole line is divided into 101 sections, generally half-a-mile long. The first is Croton dam, by which Croton water is collected. The embankment is 250 feet long, 65 high, and 45 wide at the top, and is made of hydraulic stone masonry. The beautiful sheet of water thus formed has been named Croton River Lake, to distinguish it from the artificial reservoirs; it covers 400 acres of land, and will contain 600,000,000 gallons. This will allow a discharge of 35,000,000 gallons every day.

In a distance of thirty-five miles through Westchester county are passed an-arch bridge of 80 feet, twelve tunnels or excavations under ground for the aqueduct (the aggregate length of which is 4,406 feet), thirty-two ventilators, and four waste weirs for the discharge of surplus water; and all are finished at an expence of about four million dollars. At section eighty-six, the aqueduct crosses the Harlem river; here a bridge is now building, which is indeed a Herculean task, requiring more engineering skill and watchfulness than any part of the whole line. It will consist of seven arches over land of 50 feet span, with eight arches over water of 80 feet span, and when finished will nearly equal any specimen of art in the world. Its cost is estimated at a million dollars, and its elevation is so great as not to impede the navigation of the stream, thus taking care of posterity and the wants of the metropolis when it shall extend to the Harlem river. Some idea of this vast undertaking may be formed from the fact, that the excavation for one pier has been carried 34 feet below the surface of the water, and then, a rock foundation not having been reached, 240 piles from thirty to forty feet long were driven for the purpose. Several piers have been already carried by aid of coffer-dams from four to fifteen feet above high-water mark.

Nearer the city there are more than 12,000 feet of tunnels cut through rock for two lines of iron pipes, 36 inches in diameter. Section ninety-six embraces the receiving reservoir at Yorkville, an immense structure, covering a surface of thirty-two acres, resembling an inland lake, and containing 158,000,000 gallons. The walls and embankments are of the most massive and durable construction, and the whole is enclosed by an elegant iron railing. The next two miles form the connecting link with the distributing reservoir on Murray's hill. This is a beautiful spot, and an admirable piece of workmanship, of solid granite, in form square, but much smaller than the other reservoir. Around its elevation summit, 115 feet above mean tide and 31 above surface, is a noble and broad walk, affording a most extensive view of the city, the Hudson, and the surrounding country.

The work south of the distributing reservoir consists in laying pipes to supply the lower part of the city with water. More than 100 miles of these subterranean streams have been finished, and 30 more are yet to be added. Splendid fountains will be built in the principal squares and public places, furnishing a supply of water to the poor, and, at the same time, they will be highly ornamental to the city. Those at Union square and the park are now in operation; the basin of the latter forms a circle 100 feet in diameter, with a turf bank, and the jets rise to a height of 55 feet. The former has a basin 60 feet in diameter, and three feet deep, with various jets 60 feet high, the most imposing of which presents the form of a wheat sheaf, resembling one in the court of the Palais Royal at Paris.

The whole length of the aqueduct is 41 miles; its foundation is stone, and a bed of "beton" made of broken stones and hydraulic terras; the sides are of hammered stones, and the floor an inverted arch eight inches thick. The upper arch is of the same construction. On the 8th of last June the superintendent went through the aqueduct on foot, and found the whole complete: on the 22nd the water was admitted to the depth of eighteen inches. The "Croton Maid," a small boat made for the purpose, and holding four persons, was then placed in the aqueduct, and its entire length was navigated by some of the party, to whom I am indebted for my information. This novel voyage was made sometimes at 70 feet below, and then at 80 feet above, the natural surface of the earth, at the rate of one mile in 40 minutes, which is the velocity of the current.

On the 27th of June the water was admitted into the immense receiving reservoir in the presence of a large assemblage of persons, including the mayor, governor, military, firemen, &c.; and the water has since continued to flow about two feet deep through the aqueduct, delivering into the receiving reservoir 12,000,000 imperial gallons per day, without any defect, and at a cost to each family of 10 dollars per annum for the supply. Its own force carries the stream into the highest stories of the most elevated buildings.

The names of M. Douglas, and his successor, John B. Jarvis, Esq., the engineers, will be connected with Croton Aqueduct as long as it endures; and the Americans may well call it the wonder of the "New World."

Shoreham, Feb. 8, 1843. M.

THE ATMOSPHERIC RAILWAY.

ABSTRACT OF A LECTURE DELIVERED IN THE ATHENÆUM OF MANCHESTER, BEFORE THE BRITISH ASSOCIATION, ON THE 27TH OF JUNE, 1842. BY CHARLES VIGNOLES, CIVIL ENGINEER, F.R.A.S., M.R.I.A., M. INST. C.E., AND PROFESSOR OF ENGINEERING IN UNIVERSITY COLLEGE, LONDON.

The system of producing motion on railways by means of the pressure of the atmosphere, had acquired the popular designation of the "*Atmospheric Railway;*" and it was the growing interest felt in the public mind for this new application of one of the very simple powers of nature to the uses of man, which had led the Council of the British Association to suggest the delivery of some public exposition of the principles on which it was based, and which had induced and perhaps justified the Professor in coming forward to attempt an illustration of the very ingenious contrivances which had brought these principles into practical effect. When the enormous cost hitherto incurred in the construction of railways was considered, as well as the heavy daily expenses in working these lines, it was not singular that efforts should have been directed to some means of producing similar useful results in a more economical manner.

A brief history of the discovery and gradual improvements of the first invention was gone into, tracing back the original thought to the celebrated *Papin;* in succession, long afterwards, came Lewis, Vallance, Medhurst, Pinkus, and lastly Clegg, all well known as active inquirers into this subject. But it was shown to have been *Medhurst*, who, about thirty years since, first gave to the world the right idea of connecting the body in the pipe or tube, directly acted upon by the atmospheric power, with a carriage moving along exteriorly; and that to one (already well known to science as the practical applier, economically and on a large scale, of gas for the illumination of large buildings and towns), viz. to *Clegg*, was due the merit of having worked out the suggestion of Medhurst to practical utility, in a way at once simple, efficient, and capable of enduring the rough usage necessarily attendant on constant and rapid motion.

Reference was then made to certain of the drawings and sections representing, drawn to the full size, an atmospheric apparatus equivalent in power to an ordinary locomotive engine, but occupying much less space. It is described to be a cast-iron pipe or tube of twelve inches in diameter, laid in lengths like water-pipes between the railway bars, and attached to the same cross-sleepers which supported them; on the upper part of this tube is a narrow longitudinal slot or opening, covered by a valve, the peculiar mode of opening and closing down and sealing whereof, constituted the ingenuity of the contrivance. The valve is a simple flap of leather, one edge of which is fastened down, so as to act as a hinge; the upper surface of the leather being plated in successive links with flat bar-iron, and the under surface also plated, but with links of a segmental form, to com-

plete the inner periphery of the tube when the valve was closed down. In the tube moves a piston, made air-tight by one or more leathern collars; at the end of the rod of this piston is a counterweight, to keep the rod parallel to the axis of the tube: a connection is made by one or more plates of boiler-iron of sufficient size and strength, and called the coulter, between the piston-rod and the perch of a leading carriage or guiding truck, in front of the train moving on the railway. In practice, the piston being in the tube, and some little distance in advance of the opening of the valve through which the coulter passes, a vacuum, more or less perfect, is made in that part of the tube in *front* of the piston by an air-exhausting-pump worked by a steam engine or other stationary power; the air enters by the open valve, and presses at once and directly at the *back* of the piston; the opening through which the coulter passes is raised only for a few feet length at a time, and the valve is rapidly closed down again, as the piston, carrying forward with it the train, moves on; and being closed, the edge of the valve-opening is hermetically sealed up, and the tube rendered air-tight by a composition of bees'-wax and tallow, varied in certain proportions, according to season and climate: this composition is laid at the valve edge, in a groove, into which it is pressed by a copper-slide kept just warm by heated charcoal in an attached box. The whole of the mechanical arrangements of rollers, heater, &c. are very far from being complicated, not liable to get out of order, and easily adjusted when deranged; the operation being completely effected when the carriages travel at exceedingly high velocities, as had been repeatedly done, leaving the tube ready to be again exhausted of its air, and allow the next following train to be impelled by the atmospheric pressure. In familiar illustration of the principle on which the piston-rod in the tube connects through the valve with the carriage outside, the movement of an ordinary pencil sliding in its case may be referred to.

One leading characteristic of this new system, is that of substituting stationary for locomotive power, and in this substitution the advantages would in many cases be great. Even the old system of stationary power, connected with all the obstacles of ropes, sheaves, &c., has still its supporters, both where passenger as well as mineral traffic have to be carried on: but with the numerous economies which might be combined in the atmospheric system, the stationary engine, with steam or water as a prime mover to work the exhausting pump, might once more take the field against the locomotive. This stationary power is to be erected at long intervals on the line of railway, and may certainly be placed at three or four miles, and probably at five, or even six or seven miles apart, working the exhausting pump, which would be connected by branches with the main tube lying between the rails.

The air being drawn out by the pump, a certain amount of vacuum is produced in front of the piston, creating a corresponding pressure on the opposite side of it, being about half a pound on every square inch of surface acted on by the atmosphere, for every inch rise of the barometer. In the ordinary practical working of the apparatus, the usual amount of vacuum obtained might be taken at that corresponding to 16 to 18 inches of mercury, or 8 lbs. to 9 lbs. per square inch; and experiments had fully proved that the whole, or very nearly so indeed, of the pressure due to the degree of exhaustion was obtained.

The measure of the power for producing motion was the product of the transverse sectional area of the tube in square inches, multiplied by the number of lbs. pressure due to the vacuum; various tables of these powers were exhibited, both for horizontal railways and for lines of every degree of acclivity, indicating also the respective corresponding loads, in tons, which might be taken. Thus from a tube of 12 inches diameter, with an 18-inch vacuum, or 9 lbs. pressure per square inch, there was obtained an atmospheric power of fully 1000 lbs.; being equivalent to the *average adhesive* power of a locomotive engine; and this power, with every deduction for friction and resistance of various kinds (all which were specified and tabulated), will propel 46½ tons, or 10 carriages, over a horizontal railway; and 9½ tons, or 2 carriages up an inclined plane of so steep a gradient as 1 in 28. With larger tubes and greater pressure more power could be generated, and of course greater loads propelled. These representations were not based on theory only; they were the results of the working on a piece of experimental railway for the last two years and upwards on the West-London line, at Wormwood Scrubs, only a few miles from the metropolis. The tube at this place is only nine inches diameter; but there will be a most complete practical demonstration on a larger scale shortly, on the opening of an extension of the Dublin and Kingstown railway to Dalkey, now constructing upon the atmospheric principle; the tube thereon would be 15 inches diameter, the inclination of the railway being about 1 in 110; the stationary steam-engine, exhausting-pump, &c., calculated to propel thereon heavily laden passenger-trains at very high velocities.

Reference was made to another peculiarity of this system:—If it were requisite to turn on a lathe with care and scrupulous accuracy the insides of the tubes, the expense would exceed any reasonable limits; but a simple cutter is all that is necessary to pass through the pipes on coming out of the foundry-sand; they are then placed in a proper receptacle and raised to the temperature of melting tallow: in that state a mop dipped in tallow is passed through the tubes, followed up by a wooden piston, which spreads the unguent in a complete coating, producing an even interior surface: by frequent passage of the working piston, this tallow lining, or tinning, as it were, becomes perfectly smooth, and nearly as hard as plaster of Paris, and no doubt aids considerably in preventing atmospheric leakage, causing the piston to work, practically speaking, in a tube of tallow, but protected by the iron pipe or casing.

With regard to the velocity attainable by trains impelled by atmospheric pressure, it might be said to be independent of load or gradient; in fact, it was almost strictly regulated by the proportion between the area of the tube and that of the exhausting-pump; that is, by the velocity with which the air is withdrawn from the tube by the pump. The exhausting pump piston would travel at the same speed as the steam-engine working it, viz. not exceeding three miles an hour; if the trains are required to run at the rate of thirty miles per hour, then the transverse-sectional area of the air-pump must be made ten times that of the tube, and engine-power must be provided accordingly; and so of other velocities. This was independent of the load; and gravity being practically an equivalent augmentation of the load to be moved, it was consequently also independent of gradient. The tables exhibited were calculated for various velocities, supposing there was no atmospheric leakage; this must be provided for, and is computed to require additional engine-power to the extent of six-horse for every mile of pipe; the chief leakage being at the longitudinal valve, and therefore nearly constant, whatever the diameter of the tube.

It is evident this was a superior mode of employing stationary power, since there was nothing to be propelled or moved but the carriages, and nearly the full dynamic effect of the force generated was obtained. On the locomotive system, half the load on the average of all trains consists of the engine and tender; and in the old stationary system there is the weight of the rope, with the expense and friction of all the attendant mechanism, which was enormous; and of this the

Blackwall Railway was a palpable example, although the rope-and-pulley system had probably been thereon carried to the greatest perfection of which it was susceptible. On the atmospheric system, there was substituted for a rope of hemp or wire, a rope of air, which, without weight or friction, transfers a power that may be called inexhaustible and boundless; and there was thus obtained the maximum of useful weight carried with the minimum of resistance to be overcome.

In pointing out the table containing the several horse-powers of the stationary engines to work air-pumps of different diameters, and to create and sustain the vacuum in tubes of different sizes, an explanation was entered into of the term horse-power, which was stated to be now generally computed by all makers and purchasers of steam engines from the diameter of the cylinder and length of the stroke, taking in round numbers each such nominal horse-power as capable of raising 60,000 lb. one foot high with a given consumption of fuel; Watt's old rule of 33,000 lb. had long been abandoned, the principle on which it was originally founded being now understood as incorrect, though after all it was but a conventional expression. The Commissioners who had been appointed by the Board of Trade to investigate into and report upon the atmospheric railway, had not even used Watt's rule correctly, and by this, and by reasoning and calculating on the exhausting-pump employed in their experiments as theoretically perfect, and by another unintentional misapprehension, the horse-power stated in their Report as necessary to work tubes of certain lengths and diameters, was put nearly double the horse-power as understood by the practical engineer. Some of the other opinions and conclusions of the Commissioners were also adverted to, and their soundness impugned.

It was then pointed out, that by means of self-regulating valves of a very simple character, drawings and models of which were exhibited, the trains might pass on continuously without necessarily stopping at each stationary engine; and it was also particularly observed, that it did not appear to be either necessary or advisable to vary the diameter of the tubes at each variation of gradient; but that the most convenient arrangement would be to have the tube or main by no means limited in diameter, and to work the different rates of ascent with corresponding degrees of vacuum; and this might conveniently be done, as such variation of pressure scarcely, if at all, affects the speed of the train; this, in fact, was one of the great advantages of the system, as the power expended in obtaining the keeping up the various degrees of exhaustion will be in the direct ratio of the increase of ascent, and no more. If it occurs that an inclination intervenes sharper than could be advantageously managed in this way, a larger tube may be laid down in that particular length of the railway.

A remark was made, that the atmospheric system might be applied to any existing railway without interference with the mode of working with locomotive engines during the operation.

A peculiarity of this system was explained by diagrams to the following effect:—Suppose the travelling load to be fifty tons, the degree of vacuum necessary to obtain a given degree of velocity, producing a pressure of 10 lb. per square inch on the piston; so long as the load was the same and the line level, the train would move with equal velocity, because the speed was due to the rapidity with which the air was pumped out of the pipe. But if the load be only twenty-five tons, starting with the same pressure as with fifty tons, the train then runs faster than the air is drawn out of the pipe; the power behind being so great in the first instance as to force the load forward at an increased rate. But this does not last long; the pump going slower in proportion than the train, the air gets packed up, as it were, in front of the piston, and, becoming less rarified, offers greater resistance; the velocity of the train, which is very great at first, gradually diminishes until the amount of vacuum becomes proportionate to the weight behind it, and then the train goes on uniformly. Again, supposing the train started with a load which is rather heavy, with a pressure of only five or six pounds, the air is then drawn out quicker than the load can follow, and makes the vacuum more perfect; and thus the power increasing gradually, the train increases its velocity until it becomes balanced with the vacuum. To ascend an incline may be called equivalent to adding to the load, and to descend equal to diminishing it; when the train came to an ascent it would reach the foot of the plane with a considerable velocity; but its rate would gradually decrease as it ascended, until the power was brought up equivalent to the pressure, that is, until by the exhausting pump going faster than the train, a power was generated sufficient to drive it up the hill. In coming down hill, the trains would start at the top with very great velocity; but the air would immediately begin to act in front as a buffer until the pressure was reduced. The moment the train came to the level, its velocity would immediately increase; and thus the speed was nearly uniformly regulated, whatever might be the inclination.

In entering into the question of the cost of the atmospheric railway, several tables were referred to, and it was distinctly and unreservedly stated, that from £10,000 to £12,000 per mile was sufficient to construct a line on this principle in most parts of any country. Details were prepared to show this, drawn from actual estimates made for the purposes of determining the expense of the apparatus and railway under several greatly differing circumstances; and the various economies contemplated were mentioned. It was also observed, that the recent improvements and simplifications by Professor Wheatstone of his electro-magnetic telegraph, had very greatly reduced the expense of that invaluable invention; so that for this indispensable accompaniment of the atmospheric railway, no more than £100 per mile would be required. Much stress was laid on the advantage of getting rid of the locomotive engine, which was a constant source of dangers and accidents, and had always been the cause of the most fatal ones; at the same time adding greatly to the unprofitable weight of the train, and requiring everything connected with the present details of railway construction and furnishing to be proportionably large, heavy, and expensive. On the atmospheric system, the rails, and upper works generally, the carriages, vehicles, stations, buildings, and establishments, &c., would be all very much less costly. In laying out a line, it might be suited to the undulations of the country, and earth-work greatly reduced; bridges, and all other works of art, will be on a much smaller scale, not simply in the arithmetical proportion of their heights or breadths, but more nearly in proportion to the cubes of those dimensions, and generally a saving in land, damages, &c.

But the great paramount advantage was the perfect safety from collisions and similar accidents, on the single lines of the atmospheric system, which railways worked by locomotive engines, even with double lines, cannot possibly be free from.

Reverting to the stationary power, it was stated that the adoption of other means than steam to work the air-pump and produce a vacuum in the tube, might often be expedient and economical; as water, where abundant, or where it could be collected in reservoirs; or where trains were not constantly passing, a small steam engine might be continually at work raising water to be used (over and over again if needful) on the stated times when the traffic had to pass, and a short experience would determine the exact quantity of water required to work a wheel for these given periods; and as the time

necessary to produce the required exhaustion in any length of tube was probably the same that the carriage would take to travel over the same space, the exact measure of power to create and sustain the vacuum could be calculated. But it was clear that the importance of obtaining the very cheapest method of exhausting the tube would soon attract the attention of scientific and practical men.

Allusion was made to the facilities which this system possessed of disengaging the train from the piston-rod moving in the tube; and also to the very short space in which the train could be stopped by the ordinary break, and by destroying the vacuum in front of the piston; rendered still more easy by the absence of the vast momentum, which from the weight of the locomotive and the heavier carriages, was always an accompaniment of the present trains.

A summary of the principles of the atmospheric railway concluded the lecture; the Professor observing that the invention was but in its infancy, and that it was scarcely possible to appreciate the results when further developments, practically brought out on a large scale, should bring this wonderful power still more within the grasp and command of man.

Various models, drawings, tables, and formulæ were exhibited to the meeting, and constantly referred to in the course of the lecture, of which they were intended to be illustrations.

EXPLOSION AT DOVER.

A DESCRIPTION OF THE ARRANGEMENTS PEPARATORY TO THE BLAST, BY JOHN WRIGHT, ESQ., RESIDENT ENGINEER; AND OF SOME REMARKABLE EFFECTS, BY SIR JOHN HERSCHEL, BART.

Letter from John Wright, Esq., resident Engineer at Dover, to Mr. Whitehead, the Secretary of the South Eastern Railway Company.

Folkestone, February 1, 1843.

DEAR SIR,

IN reply to your letter received this morning, I beg to forward you as correct a description of our operations in conducting the blast at the Round Down, as the very limited time allowed me will permit, and I fear, therefore, I cannot promise any very scientific or elaborate detail; indeed our surveys are not yet completed by which any accurate calculation of its result can be obtained, but which shall be forwarded immediately they are ascertained. I can, therefore, attempt only a very general description, and in doing so I must beg that yourself, or the Editor of the *Railway Times*, will kindly correct any inaccuracies and excuse the many faults so hasty a description must contain.

Between the Shakespeare and Abbot's Cliff tunnels, the line of the South-Eastern Railway is carried along the face of the cliffs at a height varying from 50 to 60 feet above the level of the sea, by means of an embankment supported and protected from the sea by a sea-wall of concrete of the height above named, and for a length of about three-quarters of a mile, for most of which length it is exposed to the sea, against the effects of which it forms a perfect and effectual protection to the railway works above. Immediately at the back of these rise the bold and magnificent cliffs to a height of from 350 to 400 feet above it; many of their projecting spurs or points crossing the line of railway require to be cut down to a proper slope, and some of greater magnitude it was considered might be tunnelled to advantage. The most extensive and formidable of them all was the projecting point of the Round Down Cliff, about 100 yards to the west of the Shakespeare tunnel, and through which a short tunnel was actually begun. The drift-ways were finished, and one length of tunnel commenced—but as it advanced, the very shaky and treacherous nature of the chalk determined Mr. Cubitt to abandon any further project with the tunnel, and to remove the cliff entirely. In this resolve he was strengthened by a succession of falls of the cliff in the spring of 1840; two of astonishing magnitude taking place on each side of the Round Down left that point even in much greater relief than it had appeared before, rendering it a striking and bold projection from the face of the cliffs on either side. At the same time the crack or slip joint, as it is termed, on which the two falls above spoken of had separated from the cliff, was easily to be traced at the back of the Round Down itself, and by levels taken daily it was discovered that the Round Down was slightly moving until it had dropped to an extent of 8 inches, following the same line of separation as the others; the foot of the cliff, however, proving too great an abutment, the settlement proceeded no further, and from that time to the present it remained stationary.

It was therefore evident, that if by any means the foot of the cliff could be removed, the whole of the upper part must fall, and Mr. Cubitt resolved to effect this by gunpowder. Accordingly, by his direction, cross sections and surveys of the cliff were made in every part, by means of which the situations of the different chambers for depositing the powder were determined, and the distance of least resistance found. The driftways already formed for the purpose of the tunnel commenced as before mentioned, giving easy access to the interior of the cliff, and in which the shafts and chambers were formed, by sinking a perpendicular shaft 17 feet deep from the bottom of the driftway; driving a short heading about 18 feet in length towards the back of the cliff, at the end of which, and at right angles to it, the chambers were excavated. Three shafts and chambers were thus formed, 70 feet apart, the west being 42, and the east 70 feet, from the ends of the driftway, the two end charges being about45 feet from the face of the cliff, and the centre charge 70 feet, which distances were also the distances of least resistance; but from the probability that at the time of firing, the craters, if they may be so termed, formed by each explosion would cross each other, and thus reduce the distance of least resistance, a less charge was determined on than the calculation for 70 feet would otherwise give—the charges ultimately determined on being 55 barrels for each end, and 75 for the centre, being 185 barrels, or 18,500 lbs. in the whole.

When the chambers were finished, before proceeding further, General Pasley, at the request of Mr. Cubitt, visited the work, and after devoting much time and attention to inspecting the chambers and verifying the calculations, gave his unqualified opinion that the arrangements were the best that could be made for the purpose. As the firing of the three charges simultaneously was an object of the utmost importance, galvanism was from the first resolved on as the means of firing, and by the advice and assistance of General Pasley, the valuable services of Lieutenant Hutchinson, R. E. (who, under General Pasley, had had great experience in the use of the Voltaic battery, particularly in destroying the wreck of the *Royal George*), were secured. Under his direction several batteries on Daniel's principle were made by men who had formerly served under him at Spithead, and many experiments were tried to test the necessary power of the batteries, because of the great length of wires that would be required. This was found to be very great, and more than the Daniel batteries at first prepared were able to produce, and as time was an object, it was resolved to add to the Daniel batteries some common zinc and copperplate batteries, as being more quickly made. Several experiments were also tried as to firing the whole of the charges by one set of wires and batteries, but although they were generally successful, it was not always so, and it was determined to fire each charge separately, by an independent set of wires and batteries, the instant of contact to be by word of command.

The whole of these various matters being arranged, and frequent practice having assured us of the certainty of firing by these means, the powder was placed in the chambers on Tuesday preceding the blast, under the direction of my assistant, Mr. Hodges, assisted by Corporal Rae, of the Sappers and Miners, whose intimate acquaintance with working the galvanic apparatus was also of great assistance to us during the time of the experiments, and on the day of the blast. The period taken up by the charging the three chambers, was only three hours. Two bursting cartridges attached to the wires were inserted into the middle of each charge. The powder was placed in the chamber in bags of 50 lbs. each, with their mouths left open, and loose powder plentifully scattered amongst them, the whole contained in a deal box, 11 feet long, 4 feet 6 inches wide, and 3 feet 6 inches high, or very nearly those dimensions, which I do not exactly remember, not having the memorandum at Folkestone. All was then securely tamped up to the top of the shaft, and partly along the driftway; the wires leading to each chamber being led along the driftway, and left at the entrance to be connected with the main wires on the day of firing.

The main wires were led over the face of the cliff to a small shed built for the occasion, on the top of the cliff, about 120 feet from the line where the separation of the cliff at the moment of falling was expected to take place. In this building were the batteries, one end of each set of wires brought into it, and the other connected with those leading to the chambers.

To fire each charge, three sets of Daniel's of six cylinders each, and two plate batteries of 20 pair of plates each, were connected.

The centre set was fired by Lieutenant Hutchinson, who gave the words "one, two, three, fire!" the eastern by Mr. Hodges, and the western by myself.

At the moment of firing, the noise and shock were so slight that my impression was it had not fully succeeded, until the cheers of the spectators informed me of the contrary. The situation of the firing-shed preventing us from witnessing the result, which I am happy to say has realised our most sanguine expectation, the cliff separating along the exact line we had traced as its probable extent, and which was defined by a ditch cut for the purpose of showing it previously.

The papers of the day will give a much better account than I can of the proceedings of the day, and the foregoing description is merely an outline describing the manner; to go further into detail would take too much time for this day's post, and should be accompanied with drawings to make it more explicit.

We are not yet prepared with any calculations as to the exact quantity thrown down, the surveys for which are in progress. The debris covers an extent of about 15 acres, and the quantity I should estimate at not much less than a million tons.

I shall be happy to give any further information I am able, and am,

Dear Sir, yours, faithfully,

JOHN WRIGHT,

Resident Engineer, Dover District.

Letter from Sir John Herschel, Bart., to the Editor of the Athenæum.

HAVING witnessed the great explosion at Dover, on Thursday the 26th, from the summit of the cliff next adjoining it to the southward, and from the nearest point to which any access was permitted, I would gladly place on record, in your valuable Journal, some features of this magnificent operation, which struck me at the time as extremely remarkable, and which have not, I think, been adequately placed before the public in any account that I have seen. These features are, the singular and almost total absence of all those tumultuous and noisy manifestations of power which might naturally be expected to accompany the explosion of so enormous a quantity (19,000 lb.) of gunpowder, and which formed, I have no doubt, the chief attraction of many who came from great distances to witness it, viz. noise, smoke, earthquake, and fragments hurled to vast distances through the air.

Of the noise accompanying the immediate explosion, I can only describe it as a low murmur, lasting hardly more than half a second, and so faint, that had a companion at my elbow been speaking in an ordinary tone of voice, I doubt not it would have passed unheeded. Nor was the fall of the cliff (nearly 400 feet in height, and of which no less than 400,000 cubic yards were, within an interval of time hardly exceeding ten seconds, distributed over the beach on an area of eighteen acres, covered to an average depth of 14 feet, and in many places from 30 to 50,) accompanied with any considerable noise; certainly with none which attracted my own attention, or that of several others similarly stationed, with whom I afterwards compared notes. A pretty fresh breeze from the south-west might be regarded as influential in wafting it away, were it not that the fall took place under the lee of the cliff on whose edge we were stationed.

The entire absence of *smoke* was another and not less remarkable feature of the phenomenon. Much *dust*, indeed, curled out at the borders of the vast rolling and undulating mass, which spread itself like a semi-fluid body, thinning out in its progress; but this subsided instantly; and of *true smoke* there was absolutely not a vestige. Every part of the surface was immediately and clearly seen—the *prostrate flagstaff (speedily re-erected in the place of its fall)*—the broken turf which a few seconds before had been quietly growing at the summit of the cliff—and every other detail of that extensive field of ruin, were seen immediately in all their distinctness. Full in the midst of what appeared the highest part of the expanding mass while yet in rapid motion, my attention was attracted by a tumultuous and somewhat upward swelling of the earth, whence I fully expected to see burst forth a volume of pitchy smoke, and from which my present impression is, that gas, *purified from carbonaceous matter in passing through innumerable fissures of cold and damp material*, was still in progress of escape; but whether so or not, the remark made at the moment is sufficient to prove the absence of any impediment to distinct vision.

As regards the amount of tremor perceived, I must confess having speculated with some little anxiety on the probable stability of the abrupt and precipitous ridge on which I stood; and might therefore have somewhat underrated the exceedingly trifling movement which actually reached that point, and which I think I have felt surpassed by a heavy waggon passing along a paved street. The impression, slight as it was, was single and brief, and must have originated with the first shock of the powder, and not from the subsequent and prolonged rush of the ruins, which I can positively say communicated no perceptible tremor whatever.

I have not heard of a single scattered fragment flying out *as a projectile*, in any direction; and altogether the whole phenomenon was totally unlike anything which, according to ordinary ideas, could have been supposed to arise from the action of gunpowder. Strange as it may seem, this contrast between the actual and the expected effects, gave to the whole scene a character rather of sublime composure than of headlong violence,—of graceful ease than of struggling effort. How quietly, in short, the gigantic power employed performed its work may be gathered from the fact, that the operators themselves who discharged the batteries were not aware that they had taken effect, but thought the whole affair a failure, until re-assured by the shout which hailed its success.

The remarkable absence of noise and tremor which characterized this operation is explained by the structure of chalk as a material, and by the rifty state of the cliff as a body. Of all substances, perhaps chalk is the worst adapted for conveying sound, and the best for deadening the vibration propagated through it by a heavy blow. The initial hammer-like impulse of the newly-created gas on the walls of the chambers of the mines (of which it must be recollected there were *three*, simultaneously exploded), was doubtless thus deadened by traversing at least 75 feet of chalk, even in the shortest direction, or line of least resistance—and *this* must have taken place before the mass could have been sensibly moved from its seat by the expansive force generated, which, however vast, proved incapable (as indeed it was expressly provided it should be) to communicate to its enormous load any greater velocity than barely sufficient to rift and bulge it outwards, leaving gravity to do the rest. Nothing can place in a more signal light the exactness of calculation, which (basing itself on a remarkably simple rule, the result of long practical experience,) could enable the eminent engineer (Mr. Cubitt), by whom the whole arrangements are understood to have been made, so completely to task to its utmost every pound of powder employed, as to exhaust its whole effort in useful work—leaving no superfluous power to be wasted in the production of useless uproar or mischievous dispersion, and thus saving at a blow not less than £7,000 to the railway company. I have the honour to be, &c.

J. F. W. HERSCHEL.

YORK'S PATENT HOLLOW AXLE.

ATTENTION has recently been drawn to the construction of railway axles, in consequence of the accidents which have occurred from their failure in two or three instances. Much interest was therefore taken by the profession in some experiments recently made at the Camden Town station of the London and Birmingham Railway, in order to test the relative advantages of York's hollow axles over those already in use. The object of the patentee in adopting this form of axle is to distribute the metal in a shape better calculated to resist the sudden strains to which axles are liable, and also to provide against the injurious effects of vibration which is continually going on.

The absolute strength of the hollow axle, compared with the solid one, to sustain a dead weight in the centre, was ascertained by experiment at the works of Messrs. R. Stephenson and Co., at Newcastle, a short time since. A hollow axle 4 inches diameter was compared with a solid one 3¼ inches in diameter. The weight of the hollow axle was 20 per cent less than the solid one.

The experiments on the hollow axle gave the following results:—

tons	cwt.		inches	
A weight of 7	14	caused a deflection of	1-16th,	without any permanent set
„ 9	2	„	3-16ths	
„ 9	16	„	3-8ths	with a permanent set of 1-8th.

Experiments on the Solid Axle.

A weight of 7	14	caused a deflection of	5-16ths,	permanent 1-16th.
„ 8	1	„	3-8ths,	„ 5-32nds.

Hence it appeared that with 20 per cent. less weight, an increased strength of 20 per cent was gained by a hollow axle, which was only ½ inch larger in diameter.

The following are the results of the more recent experiments at the Birmingham railway station, which were instituted to ascertain the capability of a hollow axle to resist violent concussion, and the torsion to which an axle is subject on the curves of a railway. The first experiment was made on one of the hollow axles, which required forty-four blows of a 38 lb. hammer to break off the journal. An axle manufactured by the Patent Shaft and Axle Company was next subjected to a similar test, and required fifty-eight direct blows, and nine reverse blows to break off the journal: this, however, must be considered an anomalous result, and appeared to be attributable to an imperfection in the axle. These axles are made on the radiating principle, one small bar forming the centre of the axle, round which are placed a number of bars, the whole being welded into one solid mass. After the axle just referred to had received two or three blows, the different bars composing the journal opened, proving the welding to have been imperfect, and to which circumstance its great toughness may reasonably be attributed, as all the other solid axles which were tried broke off when keyed in the wheels, with from one to three blows, whereas the hollow axles similarly placed required a number of blows varying from seven to twenty-eight. One of the directors of the Solid Axle Company being dissatified with these experiments, offered to place ten of his axles in competition with ten of the hollow axles. The experiments are to be tried at Wolverton, and I hope to be able to communicate the results. At present there appears to be some doubt as to which class of axles the preference should be given.

A. I. C. E.

MR. CHADWICK AND THE SURVEYORS.

THERE is no part of Mr. Chadwick's Report, in which he has meddled with professional matters, that is not full of blunders and misrepresentation. But if there be one part more objectionable than another, it is that in which he condemns the whole body of surveyors, and characterises them as ignorant and incompetent persons. Adducing instances of incompetence in individuals who call themselves, or are in their particular districts called surveyors, he arrives at the conclusion that the profession generally is unworthy of public confidence. This, however, does not in any degree surprise us, considering the general tenor of his remarks; but it might have been supposed that after all the encomiums he had passed upon the engineer who has the superintendence of the sewers of the Holborn district, and the frequent allusion he makes to the importance of employing engineers instead of surveyors, he would have left the contemplated improvements to their management. But not so; after having caressed and applauded them, he suddenly and slyly cuts their acquaintance, and prefers a corps of royals.

"It has been shown," says Mr. Chadwick, "in respect to drainage as well as good construction, that the economy and efficiency of the works will be according to the qualifications, the powers, and responsibilities of the officers appointed to execute them, secured by legislative means, and that new labour on the old condition, without skill, will be executed in the old manner, extravagantly, and injudiciously."

If any one doubts the truth of Mr. Chadwick's dogma—that the economy and efficiency of works is according to the qualifications, the powers, and the responsibilities of the officers appointed to execute them—we would refer him to the Poor Law Commission. It is amusing enough to find a person identified with that commission talking of the necessity of a responsibility in public officers. In what public office, we would ask, is a man without responsibility, except in that of the commission? There is not a page in this Report where allusions are made to professions, and persons engaged in them, in which the writer does not speak as one who feels that he has no responsibility. The qualifications of Mr. Chadwick and the Commissioners may be all that can be desired by those who appointed them, their power no one doubts, but to talk of their responsibility!—they have none, and act under the full conviction of the fact, trampling upon public opinion, the claims of poverty, and the very principles of morality. Whoever may be appointed to carry out the system of drainage and sewerage which must be shortly adopted in this country, they ought to be qualified for their work, have sufficient power to enforce the law, and be made responsible for the performance of their duty, but it is not decent for a poor-law commissioner to make the remark.

"But engineers, or properly qualified officers, having the science of civil engineering," says Mr. Chadwick, "could not be procured for every separate purpose in every part of the country, as is generally assumed in Acts of Parliament for effecting particular objects.

"From a consideration of the science and skill now obtained from these two corps (the Royal Engineers and the Sappers and Miners) for general service, some conception may be formed of the science and skill that might be obtained in appointments for local service, by pre-appointed securities for the possessions of the like qualifications, but which are now thrown away in separate appointments at an enormous expense, where qualifications are entirely neglected.

"The officers of the Engineer corps have the execution and care of structural works, docks and dockyards, fortifications, military roads and barracks, in addition to the ordinary military duties. One captain of engineers fills the office of hydraulic engineer to the Admiralty, and to his superintendence is entrusted the construction and repairs of all the docks, buildings, and other public works.

The officers of the Engineers have been distinguished for their services on some of the most important civil commissions. As collateral services which they have rendered to the public may be mentioned the trigonometrical survey of Ireland, and that now in progress for England, under the Board of Ordnance, and also the geological survey. The levelling, however, and the whole of the detail of the trigonometrical survey in England is taken by the privates, corporals, and serjeants of the corps of sappers and miners, who have been instructed in geometry, drawing, and mensuration at the school at Chatham. The triangulation for the detail of this work is executed by the engineer officers under the direction of Colonel Colby. The great majority of the surveys obtained under the Parochial Survey and Valuation Act from private surveyors have been inferior to the surveys executed under superintendence by the privates and non-commissioned officers of the sappers and miners, serving at a pay of 1*s*. 2*d*. to 3*s*. per diem. Out of 1700 first-class maps received under the Parochial Assessment and Tithe Acts, not more than one-half displayed qualifications for the execution of public surveys without superintendence. Among the most satisfactory maps of the first class of parochial surveys were those by a retired serjeant of sappers and miners. The commissioners for the colonization of South Australia found it difficult to proceed satisfactorily with persons of the ordinary qualifications of surveyors or *civil engineers* for that country, and deemed it requisite to obtain the services of an engineer officer, with a suitable number of trained men, sappers and miners, under his command."

It is difficult to keep within those bounds of expression which should regulate even the controversy of men of education, when one has to deal with a person who is so ignorant of the subject upon which he writes and dictates, as to lay himself open to the censures we must pass upon this part of Mr. Chadwick's report. This gentleman has so contrived to distort and misrepresent facts in the statements he has made in the very remarkable paragraphs we have quoted, that it is difficult to attack him upon a principle. It is not, however, our intention to allow him an escape under a subterfuge, and we will therefore consider first his data, if such his assertions can be called. There is an unintelligible jumble of statements

in the paragraphs we have quoted, evidently intended to exalt the military surveyor or engineer, and to lower the civil, in the estimation of the government and the country. The facts have no connexion with each other, but "the privates, corporals, and serjeants of the corps of engineers, and of the sappers and miners," are placed in advantageous contrast with, and preferred to the engineers and surveyors in private practice. The reporter has managed to express as many unfair and false statements in four paragraphs, as were ever written in the same space, from the days of the romancers to those which immediately preceded the establishment of a poor law commission. But the gist of the whole is, that the trigonometrical surveys by military men are better done than the plans by private surveyors under the parochial survey and valuation act. Can anything be more unfair than such a comparison? In the trigonometrical survey, which the government ought, for reasons to be presently stated, to have committed to the hands of civilians, and not to the military, time was a matter of no importance, the pay was continued, and there was no inducement to haste; the means of existence was secured, and there was no possibility of loss. But the private surveyor had to tender at so low a price, that no man who could find anything else to do would even compete for the employment. Not one out of fifty who did their work in a professional and accurate manner, received the amount of their expenditure, and for this cause the work was frequently left to incapable persons, who assumed the name of surveyors for the occasion, and began to read a treatise on land-surveying, when their tenders were accepted. And yet, upon this evidence, Mr. Chadwick presumes to throw disgrace upon a profession, and to prefer the privates, corporals, and serjeants of the engineers and the sappers and miners, to the surveyors in private practice. The only wonder is, that he did not avail himself of the surveys made for the Reform Bill, which would probably have been still more suitable for comparison, if it had been equally expedient to have quoted them. It is well known to the profession, that on that occasion many persons were selected as surveyors who did not even know that such an instrument as the theodolite was in existence. Many were distressed impoverished artists, who trusted more to the accuracy of their eye in sketching, than to any qualifications they possessed as surveyors. There were some persons, to our own knowledge, employed at that time, who had never seen a land-surveyor's chain, and we know one gentleman who has since been entrusted with large public engineering works, who, when he had been himself rejected from want of interest, taught, for the sake of a few pounds, several applicants who had been more successful than himself, the first principles of surveying, and the use of instruments. The fact is, that the profession is impaired in the first place by the employment of uneducated and incompetent persons, instead of those who, by study and practice, have qualified themselves for their business, and the profession is then made responsible for all the blunders committed by those who, though they have assumed the name, and stolen the employment, have been destitute of the qualification.

It is not to be doubted that there are quacks in all professions, men who are sheltered by a name, and gain by impudence what they are conscious is not due to them from experience. Such may be found even among the royal engineers and the sappers and miners, who instructed, and at the same time supported by the country, ought to have no other care than that of acquiring a superior knowledge of their professions. Architecture, engineering and surveying, are more exposed to the invasion of quackery than any other liberal professions, because no test of knowledge is required previous to profession. We are not advocates for any such exclusive system as that thought necessary for the protection of lawyers, surgeons, and apothecaries; we are not anxious that a certain term of apprenticeship and certificates from certain professors should be indispensible, though we admit they are desirable; for the knowledge of the arts and the sciences on which these professions depend, is frequently acquired by men from genius and persevering study in private spheres, who would be ornaments to the professions, and ought to be admitted. Some authorized body, however, for the examination of candidates, is necessary, and would prevent such unmerited imputations as Mr. Chadwick has thought proper to throw upon the surveyors as a class. Whatever incompetence may be exhibited by a person who calls himself a surveyor, whether of roads, pavements, sewers, land, houses, or anything else, is seized upon by the Poor Law Commissioners' secretary, as an evidence of the ignorance of the profession. Apply the same test to any other body of professional men, that for instance to which Mr. Chadwick himself belongs, and if the lawyers—counsel, attorneys, and solicitors, are not found much more incapable than the surveyors, we will confess that we have formed a very erroneous opinion of their qualifications. Why is the client daily put to the expense of opinions from pleaders, in such simple cases as that of suing for debt, if the solicitors of the day are competent practitioners of the law. And as to the costs of surveying, in comparison with those of the law, we challenge Mr. Chadwick to the examination.

The question of expense incurred by the employment of surveyors, is put by Mr. Chadwick in his usual unfair and inaccurate manner. After drawing a comparison between the military engineers and the civilians employed in the survey of land, he commences his comparison of the relative expenses of the two classes, by stating the presumed emolument received by surveyors of *houses* under the building acts, and the cost of "a whole board of superior officers at the rate of pay to the officers of the corps of engineers." Taking, as an example, the town of Leeds, he assumes that the average rate of increase of houses, is 855 per annum, and of families, 940, "which is two new houses and three-tenths per diem, which, if they were only fourth-rate houses, would be required to pay in fees £4 12*s.* per diem for two or three hours' service, at the ordinary rate of payment to private surveyors" this statement we entirely deny, but will take another opportunity of disproving it. For this sum, says Mr. Chadwick, a board might be formed of one colonel, one lieutenant-colonel, two captains, two first-lieutenants, two second-lieutenants; or of one captain, two first-lieutenants, three second-lieutenants, one colour-serjeant, three serjeants, six corporals, twenty-two privates. From such a statement as this, any confiding reader would conclude that either of these military boards could be supported at an expense to the country of £4 12*s.* per day; but the slightest reflection will detect the error of the calculation. This is the amount of their pocket-money, the country providing them with bed and board. This is but one item in the calculation of expense; to it must be added the cost of erecting and maintaining barracks, of clothing, supporting, and educating the men, as well as of supplying them with the necessary instruments; all the time that has been lost in their education, during which they have been equally expensive, and could make no return of services, and also the number of those who, after all the expense, are never brought into any service by which the country is benefited one penny. If Mr. Chadwick will take these additional items into his consideration, and many others with which we will supply him when he feels inclined to correct his estimate, he will come to a very different conclusion.

The fact is, that every civilian who enters practice as a surveyor has qualified himself for his duties, or is supposed to have done so, and is only paid for the knowledge and skill which he does or ought

to supply. But it is not so with the military surveyor or engineer. For his support and education the country has paid, perhaps, many years before he is fitted for the execution of the duties he is required to perform, and not for his only but many others, in fact the whole body of men to whom he belongs, some of whom die, some are incapable of learning, and the greater number of those who remain after these deductions have no employment, or at least none which brings any profit to those by whom they are supported.

But these remarks suggest another inquiry. For what purpose are the two military bodies, the Royal Engineers, and the Sappers and Miners who are so highly extolled by Mr. Chadwick, supported by the country. It has been supposed that they were necessary for military services, which is the only pretence for retaining a standing army. If it be now found that this supposition is erroneous, why is the country any longer called to defray the heavy expenses incurred by their support? If they can be employed in civil services it is surely a fair argument that they are not wanted for military, and then, why are they not disbanded, and the public money saved, which, upon this showing, is uselessly expended? That they should be admitted into civil service is as impolitic as it is unjust. It is impolitic, because it admits such a deduction as that we have suggested; it is unjust, because the man who has paid for his own education, and supported himself in a sphere of life called professional, finds himself brought into competition with men who have been instructed, clothed, fed, and entirely supported at the public expense, and to which he has consequently contributed his share, and he is at the same time lowered to the rank, in Mr. Chadwick's notable scheme, of a private, or at best that of a serjeant, in the Royal Engineers. Again we ask this reporter to carry into his own profession the doctrines he inculcates for reforming the practice of engineers and surveyors. Why should the bar be protected by restrictions, and the public be compelled to pay a counsel hundreds of pounds for conducting a case, when he might frequently obtain for as many shillings as good a head, and as good a speech, and that from a man who received his gifts from nature, and his knowledge from personal application, without being indebted to the public for a penny? If errors are to be found in the present system,—and in what professional practices are they not to be found?—they must be traced to the state of the law, and not be thrown upon the backs of the men who are oppressed rather than benefited by it.

But, independent of all considerations as to the relative cost of employing military men in public services unconnected with their duties, whatever may be their attainments, we object to the practice for the reason that it tends to restrict and cramp the energies of the man of science, and to introduce military control over the people. That Britain should have so long retained her high station in science, with so few encouragements from government, is not the least remarkable circumstance in her intellectual history. In other countries the government has a difficulty in urging the people to scientific improvements, because all the men of science are more or less connected with it; but in this country the people are generally prepared for an intellectual advance before the government is ready to admit that it is desirable, and this because the men of science are in constant communication with, and form an important class of, the industrious population. The opportunities of remuneration for their energies are already too few, being entirely restricted to the professions whose interests we represent, and those branches of commerce which depend upon mechanical or chemical investigations. To invade the legitimate employments of these men by a paid military force would destroy the last hope of every man of science who is in any way dependent on his bodily or intellectual labour for his support, and necessarily turn his attention to other pursuits in which he would probably be more profitably employed for himself and his family, but less so to the country. In withdrawing an opportunity of support from this important class, a fertilizing stream of knowledge most beneficial to a country would be dried up, and the intellectual resources proportionally impoverished.

Mr. Chadwick has exultingly pointed out the successful operations of the military engineers in the trigonometrical surveys, and, without waiting to show that it was an improper employment for that body, cost the country a larger sum than if it had been intrusted to civilians, and deprived an equal number of men of the employment and patronage they have a right to expect from the hands of the government, we will give some other facts for comparison than those which Mr. Chadwick has been pleased to suggest. To whom, we would ask, are we indebted for the discovery of those principles upon which the now almost perfect science of geology is founded? William Smith, a surveyor, who belonged to one of the classes so despised by Mr. Chadwick, was the discoverer, not only of the great fundamental fact of the super-position of rocks and their characteristic organic remains, but he was the first to form a scientific classification, and to prepare a geological map of England. By whom have the most important contributions to this science been made? Who discovered and first constructed the steam engine, and by whom have the subsequent improvements and applications been suggested and put into operation under all the disadvantages which, in this country, so fearfully impede the progress of science, and prevent its followers from reaping, without a fee to the government for their ingenious thoughts, the recompense of their labours? These, and a thousand other discoveries and improvements, indeed, we may say, all that have been made in the present century, have been the results of that energy of thought which is common to minds of a high order when they have to struggle with the difficulties which surround them in the effort to gain subsistence, rank, and fame, and so rare when in their earlier career they have been rocked in the arms of indolence, and flattered by the possession of a station and competence for which they have not had the necessity to toil.

But although we have felt it our duty to defend the surveyors as a respectable and well-informed body of professional men against the sweeping imputations of Mr. Chadwick, we are not to be supposed the advocates of that large class of persons to whom the name is sometimes applied, but who are not only ignorant of the first principles of a professional education, but are scarcely able to write their own names Mr. Chadwick has, for his own purposes, chosen to confound these two classes, and to draw conclusions from the incapabilities of one to the prejudice of the other. It has suited his object to place the surveyor attached to one of the Metropolitan boards upon the same level as a surveyor of roads or pavements in an obscure country parish. The term "surveyor" is frequently applied to any person who has the superintendence and direction of others in constructive works, and although it conveys the idea of superior knowledge, it by no means points out the employment and responsibility of that class of persons who receive the name in large towns. The duties of the several professions connected with the art of building are much less accurately understood among persons of education living at a distance from the metropolis than might be expected. We have met with men of family and wealth who have supposed architects, till absolutely brought into connection with them, to be a sort of superior builders, and could give no other meaning to the term surveyor than that which they had been taught by their association with the parochial boards of their districts. The mis-application of the name has tended

greatly to the detriment of a valuable class of men, and it has been Mr. Chadwick's policy to increase the confusion, and make them responsible for all the stupidity and knavery that is practised under their name. Many of the surveyors, fearing association with the classes to which allusion has been made, have lately called themselves engineers, but even this now honoured term will be gradually debased by the assumption of incompetent and unworthy persons, unless some mode of protection be adopted. In all the three professions a higher standard of excellence is required, a more rigorous and a sounder education, and a proof of qualification before practice; and Mr. Chadwick will have done us some service without intending it, if his remarks should stimulate us to the accomplishment of these important means of self-protection.

THE ARTESIAN WELL AT SOUTHAMPTON.

A FEW years ago the chief supply of water to the inhabitants of Southampton and the shipping that frequented the port, was from surface drains and springs on the common. This supply was considered inadequate for a larger number of ships, and an increasing population. The Commissioners of Water-works for the town, therefore, engaged Mr. Clark, of Tottenham, in the autumn of 1837, to make an experimental boring in the vicinity of Southampton, to ascertain from what depth a very large supply of water could be found. The spot selected for this purpose was on the common, on the west side of the main road to Winchester, near the race-course, and within the boundary of the borough.

The boring was carried down to the depth of 480 feet below the surface, and at that depth Mr. Clark reported that an unfailing and almost unlimited supply of water could be found. A contract was soon afterwards entered into with the Commissioners for sinking a shaft, and forming an Artesian well on a scale of magnitude such as had, perhaps, never before been attempted.

This shaft has been sunk to the extraordinary, and, for the purpose of obtaining water, unequalled depth of 560 feet. The diameter of the excavation is 16 feet, from the surface to the depth of 160 feet; 14 feet from 160 to 210 feet, below which the diameter is again reduced, until, at the entrance of the chalk, it is diminished to 8 feet 6 inches. From the commencement of the chalk to the termination of the shaft, the diameter of the excavation is 7 feet: from the surface to the depth of 480 feet, the shaft is protected by cast-iron cylinders, and brick-work set in hydraulic cement, which prevents the water from the upper soils flowing into the well. The boring commenced at the depth of 560 feet, and the depth through which it has passed, up to the present time, amounts to 350 feet, thus making the whole depth attained by excavating and boring to be upwards of 900 feet. The depths of the different strata through which the excavations passed before reaching the chalk was as follows, viz.,—

1st,	Alluvial deposits,	60 feet deep,
2nd,	London, or blue clay,	320 ditto,
3rd,	Plastic clay . .	85 ditto,

Fossiliferous shells, petrified wood, layers of limestone, sandstone, and pebbles were met with during the process of excavating. The shells were of the same description as those found in the London basin. The pebbles were much worn and rounded, and the layers of limestone were of an exceedingly hard nature.

It is deserving of notice that the large supplies of water from Artesian wells are often found at the junction of two contiguous beds or strata. In the instance of the Artesian well at Southampton, however, when the plastic clay was penetrated, a thin layer of green-sand alone intervened between the clay and the chalk.

The excavations were all performed by manual labour, and the water which accumulated in the shaft was pumped out by means of steam power. Extraordinary difficulties attended the formation of the shaft, and the means taken to protect it. Many layers of stone, several feet thick, were encountered and passed through. Irruptions of sand often happened, and during a long period the choking of pumps and the breaking of rods, shafts, and other parts of the steam engines made use of, were of frequent occurrence.

The steam power employed consisted of two engines, each of 24-horse-power. They were necessarily used for a long period to prevent the accumulation of water from interrupting the progress of the formation of the shaft. The water the engines pumped from the well flowed into the reservoirs during the years 1839, 1840, and 1841, by which means the supply from the reservoirs to the town was very considerably increased. The boring from the bottom of the shaft commenced at the beginning of the present year, and the machinery for that purpose was situated at about 40 feet below the surface, which was above the maximum water level of the shaft. The situation at which the machinery was placed rendered the water in the well no longer a hindrance to the labour of the workmen; but, in consequence of the dearth of water, and the dread of fire during the last summer, upwards of 1,250,000 gallons were pumped from the shaft, and flowed into the reservoirs at intervals between the 17th of October, and the 25th of November last.

From the magnitude of the shaft and the immense depth which has been attained at this well, the operations for finding water have become an object of the greatest interest and curiosity to the scientific portion of the community. Some of the most eminent geologists in this counrry, including Professor Buckland, Mr. Lyell, and Sir William De la Beche, have visited these operations. A number of individuals belonging to scientific bodies in the metropolis have also been attracted to Southampton to examine the well, and all have expressed their utmost anxiety to see it completed.

In many respects the Southampton well bears a resemblance, particularly in the nature of the soils through which the excavations and boring have passed, to the celebrated Artesian well in Paris. This well, which has a shaft, however, no way comparable in extent to the one at Southampton, is of the depth of 1700 feet, and many have supposed that the water is forced up from that enormous depth by volcanic agency. Apart, therefore, from considering the Southampton Artesian well as a stupendous undertaking, pursued through innumerable difficulties, that great practical benefits are anticipated from it in its supplying an abundance of wholesome water to a rapidly increasing population, and to a vast quantity of yachts, merchant ships, and steamers, that leave this port for all parts of the world, no lover of science or inhabitant of Southampton can help viewing an undertaking near this town with curiosity and pleasure, which will, in all probability, when completed, rival the wonder of the French capital in magnitude, interest, and importance.

It would be an obvious injustice if this notice omitted saying, that the superintendent of the works on the Common, Mr. Thomas Docwra, has proved himself to possess a mind most fertile in resources, by which he has triumphed over the many obstacles he has encountered, and which will enable him to bring the extraordinary undertaking he superintends to a successful termination.

The Southampton Artesian well is situated at an elevation of 129

feet above the level of the sea, which is of a sufficient height to allow water to flow from the surface into the present reservoirs.

The water from the well has often been analysed, and proved to be of excellent quality.

PROPOSED COMMISSION TO INQUIRE INTO THE STATE OF THE METROPOLITAN SEWERS.

Sir James Graham has stated in the House that Government is about to empower immediately a Commission to inquire into the state of the metropolitan sewerage. The value of this inquiry will entirely depend upon the qualifications and honesty of the persons selected for this important duty. It is a subject in which we feel the deepest interest, and we shall not hesitate to express our opinions freely upon any objections which can be fairly raised against the persons to whom the investigation is delegated. To the appointment of military men, whatever may be their qualifications, we entirely object, for reasons we have elsewhere stated. As there can be no doubt that there are many eminent engineers, surveyors, and other practical men who are thoroughly acquainted with the subject, and as the subject of inquiry is unconnected with the duties of the military office, there can be no excuse for depriving the professions of the emolument or honour to be derived from such an investigation.

In our last Number we exposed the ignorance and self-conceit of Mr. Chadwick upon one subject connected with this inquiry, and in the present Number we have not hesitated to defend an important and useful profession from the sweeping censures he has thought proper to pass upon its members. It must not, however, be supposed, that there is any desire on our parts to hide the defects of the present constitution of the Courts of Sewers, or the defective systems adopted by some of them. Our object was, to show that Mr. Chadwick had interfered with a subject upon which he was unqualified to give an opinion; and that he had risked assertions which were unsupported even by the partial evidence he adduced to substantiate them. Instead of satisfying himself with a report upon the sanitary condition of the labouring population, he injudiciously blames all the commissions for the supposed errors of some, attacks public bodies and professions, pulling down one and putting up another with all the reckless indifference that so singularly characterizes every act of the Commission with which his name will ever be identified. As soon as a fancied improvement is conceived, every interest must give way to secure its trial, and one individual, who has introduced changes of doubtful value, is applauded as a man of skill and science at the expense of all who have not coincided with his opinions, or adopted his suggestions. These are the grounds of our complaints against Mr. Chadwick, and such are the views with which we have, as a public duty, exposed the dogmatism and fallacies of those parts of his Report in which he has fearlessly condemned and recommended upon questions on which a man of experience and science would speak in a far less decisive tone.

That great improvements are required in the entire system by which the sewerage of the metropolis is regulated, cannot be doubted, but much of the blame which is now thrown upon the present courts and their officers is in fact to be attributed to the present state of the law. In some of the best constituted and most active commissions, the law is strained to the very verge of illegality to meet the wants of the community, but still they are in many instances compelled to insist upon foolish and even unjust practices, because they are invested with a power which is injuriously restricted in some respects, and in others as much exceeds the bounds of propriety. The new Commission of Inquiry will do well to make this subject a question of primary investigation, for until the state of the law by which the present Commissions are regulated be known, it will be injudicious either to blame or acquit those who have the execution of it. This is the origin of all the evil.

SOCIETY OF THE FINE ARTS, PARIS.

SESSION OF MONDAY, 8TH NOV., 1842. M. HITTORFF, PRESIDENT.

The session opened at half past seven.

The secretary having read the proceedings of the preceding session, the minutes were put to the vote and adopted.

CORRESPONDENCE.

M. the Minister of Public Instruction acknowledged the receipt of some copies of a report that had been made to the society upon the works of M. de Montabert, and informed the society that, according to the orders he had given, every copy would be immediately forwarded to its destination.

M. le Chevalier Perruzzi, the resident minister of Tuscany, acknowledged the receipt of the medal and diploma awarded by the society to M. Grambassini for his modal of St. Peter's at Rome. M. the minister at Tuscany thanked the society for this mark of good will and approbation accorded to a Tuscan artist.

Colonel Amoros, Marquis of Sotello, who was absent from indisposition, expressed his regret at not having been able to re-unite himself to the members of the society at the time of the funeral of their late venerable colleague M. Miel.

Madame Bureaux had forwarded five bundles of papers belonging to the society, found among those of M. Miel her father.

The society of agriculture, commerce, sciences, and arts, of the department of Marne, presented the programme of its public session, of the 20th of October last, and the list of medals it had awarded.

The president announced to the members of the society that one of their colleagues, M. Duval-le-Camus, had just received from his Majesty the King of Belgians, the cross of Leopold.

The order of the day called for discussing the propositions of M. Normand the elder, relative to the mode of admitting honorary members. The president, after having read the proposition of M. Normand, acquainted the society with the method proposed by the council, with which M. Normand perfectly agreed.

After a discussion, in which MM. Bourla, Valois, A. Noel, Carpentier, and Montagny took a part, the president again read the proposition, which is as follows:

ART. 6 OF THE REGULATIONS.

"All persons desiring to be admitted into the society as honorary or corresponding members must, &c.

"Honorary members shall be proposed in writing by an ordinary member of the society; and the proposition shall then be laid before the council, assisted by the presidents and vice-presidents of the different sections, who shall deliberate upon the propriety of submitting it to the society.

"The vote for admission shall be taken without discussion, and shall be decided by a secret scrutiny, and a majority of two thirds of the members present."

The proposition of M. Normand the elder, having been fully discussed and passed through the several forms required by the regulations of the society, was put to the vote and adopted unanimously.

M. Hittorff presented to the society an engraving of a design by Mr. Cockerell, architect, one of the foreign members of the Institute. This engraving, which represents a group of all the buildings executed in England by Christopher Wren, is the greatest honour to Mr. Cockerell. The society was especially struck with the extraordinary genius that must have been possessed by the man who could have designed and executed these works, but at the same time applauded the ability of the artist who, with great energy of science and taste, was able to group so happily, upon one sheet of paper, so many edifices, as various in character as they are numerous.

On the occasion of presenting this engraving, the president gave a brief account of the life and works of Christopher Wren. He was born in the year 1632, and was eminently endowed with faculties for

the study of the mathematics; and such was the precocity of his genius, that at the age of twenty-five he professed the mathematics, mechanics, and astronomy at Oxford. In 1665 he visited Paris. Recalled to London by the fire of 1666, which destroyed the greater part of that city, Wren turned his attention to architecture, and his genius produced a vast and magnificent plan—the creation of a great architect—for its re-construction. This plan was, no doubt, considered too gigantic to be entirely adopted, but it was partially followed, and its author was successively entrusted with the erection of St. Paul's, in London, the greatest monument of that kind after St. Peter's at Rome; more than fifty parochial churches of greater or less importance; the ancient custom-house; the Monument, a column 60 metres in height; many colleges and other edifices, public and private, and Temple Bar, the gate of the city. Near to Winchester he erected a royal and episcopal palace; also the front of that at Hampton Court, that of Chelsea, and that of Greenwich, the theatre at Oxford, and many great restorations of Gothic monuments.

It may, however, be well to remark, that Wren, who, during his stay in Paris, had seen the monuments of Lemercier, those of Blondel, Perrault, and Mansard, was inferior, though he had great learning and taste, to those illustrious architects. His buildings, though generally of imposing aspect and fine in the mass, too frequently remind us of the ramblings of Boromini.

Wren was modest, and above all, disinterested; though this did not prevent his being suspected, if not accused, of speculating upon the time required for the execution of his works. As architect of St. Paul's, he received the nominal remuneration of one hundred pounds a year. Was it not, however, supposed that he retarded his works for the mere purpose of enjoying for a longer time his appointments? At first it was only imagined, then it was believed, and the parliament reduced the fee of the architect to one half, allowing him twelve years for the completion of the work. At the age of seventy Wren retired to the country, where he spent the remainder of his days in peace, and almost forgotten by his contemporaries. Wren died in the year 1723, at the age of ninety-one, and then they seem to have remembered him, and the honour of being interred under the cupola of St. Paul's was granted to him and his family.

The president announced the presence of M. Reynes, director of the drawing school of Avignon. M. Reynes was pleased to inform the society of the truly remarkable work of a sculptor of Avignon, James Bernus, who lived about two hundred and fifty years ago, but who has been entirely forgotten even by his own countrymen, although his works, like the one presented to the inspection of the society, exhibit in the highest degree the eminent qualities of a superior artist. This communication was received by the society with marks of great satisfaction, and admiration of the works of Bernus. The society recommended M. Reynes to persevere in his efforts to draw attention to the works of unknown genius which he had so nobly undertaken. The society invited him to communicate any discoveries he might make concerning the life and works of Bernus, and a description of the works of that artist which he has preserved in his valuable collection. Upon the suggestion of the president, the thanks of the society were voted to M. Reynes.

In the interval between this and the preceding meeting the society had lamented the loss of some of its members. M. Miel, one of the oldest and most zealous of its members, who but a few days ago, although then suffering, was addressing to the society two remarkable reports upon the works of the Academies of Dijon and Douai, died on the 28th of October. By attending the funeral of this venerable colleague the society desired to express how deeply it was affected, and upon this melancholy occasion M. Hittorff, the president, made himself, in the following words pronounced over the tomb of M. Miel, the worthy interpreter of the grief and regret of all:—

GENTLEMEN,

It is a melancholy duty to speak over the tomb of a righteous man,—of a man of merit, and of a friend; one tried by an intimate intercourse for a period of twenty-five years. If anything can alleviate the bitterness of this cruel necessity, it is the thought that there is an end to the long sufferings of our friend, and the comforting hope of a happier life than that which the Almighty allotted him amongst us. This day gives to him the happiness of the just, but to his unfortunate and devoted daughter, his three children, orphans, to all the members of his family, and to all his friends, the grief of an irreparable loss.

This grief will be great, sincere, and of long duration, for it will be renewed to all those who have known M. Miel, whenever they speak of a professional man distinguished by his integrity, of a learned and conscientious critic, of a distinguished man of letters; whenever they name a father or a friend, a man capable of submitting to any sacrifice, to fulfil the duties of one at the head of a family, to discharge the obligations of friendship, and to anticipate the wants of suffering humanity, and whenever any question connected with the propagation and encouragement of the arts is discussed, this grief will be renewed.

Who more than our friend has devoted his life and all his faculties to assist our artists? Whether he praised their excellencies, establishing them upon principles founded on a sure philosophy, or whether he blamed their defects, his enlightened and benevolent criticism always directed true merit into the laborious and difficult road which leads to fame, and often stopped the young artist when hastening to a more easy path, which leads to a false and perishable renown.

It will always be a matter of deep regret to those who have been acquainted with the pursuits of M. Miel, that they have been deprived of the completion of a work which has been the occupation of his life: I allude to "L'histoire de l'Art français," of which the greater number of biographical notices and other articles on the fine arts which have been inserted in the papers and other periodicals were extracts or preparatory materials. If France could have boasted of such a volume, she would have possessed a work, which, to do it justice, would have been to us most precious, and to artists in general not less interesting than the work on the Lives of the Italian Painters, to which Vasari is chiefly indebted for his celebrity.

On the eve of his death, and with a conviction that but few hours were reserved for him, the regret of our friend was, that he should be taken from the world before the education of the youngest of his sons was completed, and that he could not execute that work which would have been a monument raised to the glory of our artists as well as to its author. That his history was not completed must be attributed to that entire denial of himself which so remarkably distinguished M. Miel, whenever he had an opportunity of performing some new act of kindness, or of making a new sacrifice for the benefit of the artists whom he so much esteemed; it was, indeed, the devotion of the greater portion of his time to the Society of Fine Arts, ever since its formation, that prevented him from completing his work.

Feeling confident that this society, when once firmly constituted, and strengthened by time, would offer the most certain means of prosperity to the arts, M. Miel considered his unceasing attention as a sacred mission—a mission so much the more attractive to his disinterested mind, that the good which he expected, without being reflected on him, ought to have been the more profitable to this Institution. A great number of his works, however, in memoirs, biographies, and reports, as well as the part of the publications of the society which our friend directed, will preserve his name. These works, proofs of his great talent, and of his varied and extensive knowledge, will remain in the memory of all the members of this Society; they will stimulate in times to come, and for a long period, the zeal of our successors, for to them the example of a member so worthy and illustrious will not be lost.

As for ourselves, Gentlemen, let us preserve that ardent love to the arts which so greatly animated our venerable friend; let us not forget that a month since, though ill and scarcely able to walk, he went with most of us to visit the church of St. Denis, and that the recollection of this last artistical excursion occupied his mind only a few hours before his death. These recollections, as well as that of the friendship of the illustrious David and the most distinguished artists of those times, as well as our own, was a great consolation to M. Miel amid the many pains with which he was afflicted. If these compensations sustained him, and gave him resignation to wait for his last hour with the serenity of a just man who hopes for a better futurity beyond the term of this life, we may say once more,—"the blessings of the just are his who has left this world, the sorrows are ours who remain in it."

After this discourse, listened to with great attention and profound feeling, it was decided that the council should, in the name of the society, wait on the family of M. Miel, and present its condolence.

INSTITUTION OF CIVIL ENGINEERS.

Session 1843.

ANNUAL REPORT.

THE period has again arrived when it is the duty of the Council to present a Report of the Proceedings of the past Session, and of the actual state of the Institution.

This Report may be more succinct than heretofore, not because

less interest attaches to the proceedings of the Institution, but because the attendance of the members of all classes at the evening meetings has been so regular, that any lengthened notice of the events of the past year would be but a repetition of what is already well known to them, and the published minutes have conveyed ample accounts of the proceedings to the non-resident members.

It will be sufficient to say that the evening meetings have been full of interest, and that the general state of the Society is satisfactory.

Although no changes have been made in the Bye laws, either during the Session of 1841 or 1842, certain modifications of the forms of conducting the business of the meetings have been introduced, and it is necessary that an account of the result should be given.

The resolution relative to the furnishing original communications by Members of Council, has had the effect of producing papers from Messrs. H. R. Palmer, J. Macneill, and J. Taylor; those of the two first named gentlemen have been read, and the other remains to be read during the present Session.

The discontinuance of the practice of reading abstracts of papers, and the introduction of a monthly, instead of a weekly ballot for members, has permitted more time to be devoted to the discussion of the communications; a reference to the minutes of proceedings of the past year will show how well that time was employed.

The recorded observations of members of the profession, and of other scientific men, in the discussions upon "The South Eastern Railway," "On Kyanizing timber," "On the Turbine," "On Professor Moseley's Constant Indicator," "On the forms of Breakwaters," "On the Maplin Sand Lighthouse," and "On the Water of the Chalk Basin of London," showed not only how well they were versed in the respective subjects, but the value of the opportunity thus afforded for eliciting these remarks. It is the anxious desire of the Council to encourage these conversations, their utility in promoting the objects of the Institution being undeniable.

For some years the Council have been under the necessity of reminding many of the Graduates, that their engagement to present original communications remained unfulfilled: they are sorry to have occasion again to revert to this subject, but they hope that the good example set by some of their class, the abstracts of whose papers appeared in the minutes of last year, will not be lost upon them; and that some portion of this season of comparative inactivity will be spent in drawing up detailed accounts of executed works, with which they must be familiar.

Among the various duties of the Council there is not a more delicate, but at the same time a more pleasing task, than that of awarding the Telford and Walker Premiums. These awards have hitherto been satisfactory to the members generally, and your Council trust that those of the past year, and the list of subjects which they have framed for the present Session, will be equally approved of.

It has been customary, in the Annual Reports, to give an analysis of the papers to which premiums had been awarded; but last year the Council judged proper to curtail the remarks upon them, and on the present occasion none have been made, because the fact of their being considered deserving of premiums is sufficient commendation, and the published abstracts of them will have rendered their contents familiar to every member.

Telford Medals in silver have been awarded to Robert Thomas Atkinson, for his paper "On the sinking and tubbing or coffering of Pits, as practised in the Coal Districts of the North of England;" to William Cotton (Governor of the Bank of England) for the "Memoir of Captain Huddart;" to the Chevalier Frederik Willem Conrad for a "History of the Canal of Katwyk (Holland), with an Account of the Principal Works upon it;" and to James John Wilkinson for an "Historical Account of the various kinds of Sheathing for Ships."

A Telford Premium of books has also been added to the medal awarded to Mr. Atkinson.

Telford Premiums of books have been awarded to Thomas Casebourne for the "Description and drawings of part of the Works of the Ulster Canal;" and to Thomas Girdwood Hardie for the "Description and drawings of an Iron-work in South Wales."

The Walker Premiums of books have been awarded as follows:—To Charles Nixon for the "Description and drawing of part of the Tunnels on the Great Western Railway;" to Alexander James Adie for the "Description and drawings of the Bridges on the Bolton and Preston Railway;" to John Brannis Birch for the "Description and drawings of the Bridge at Kingston-on-Thames;" to Robert Richardson for the "Description and drawings of part of the Works of the London Docks;" to James Combe for the "Description and drawings of Messrs. Marshall's new Flax Mill at Leeds;" to Charles Denroche for the "Description and drawings of the apparatus used for compressing Gas for the purposes of illumination, &c.;" to Adrian Stephens for the "Description of the explosion of a Steam Boiler at the Penydarran Iron-works, South Wales;" to George Ellis for the drawings illustrating the "Description, Specification, and Estimates of the Calder Viaduct on the Wishaw and Coltness Railway; with a series of experiments on the deflection of Trussed Timber Beams for that work," by Mr. Macneill; and to Thomas Chalmers for the drawings illustrating the "Report on the sinking of two experimental Brick Cylinders, in an attempt to form a Tunnel across the River Thames," by Mr. John Isaac Hawkins.

Among the original communications read during the Session, and to which premiums have not been awarded, there are several of which it is sufficient to mention the titles, in order to recall either their intrinsic merit, or the discussions to which they gave rise. Among these are "The Description of the Harbour of Port Talbot (Glamorganshire)," by H. R. Palmer, V.P.; and the "Description of the Calder Viaduct, on the Wishaw and Coltness Railway, with Specifications and Estimates, and a series of Experiments to ascertain the deflection of two of the trussed Beams," by John Macneill. Both these papers were precluded from coming under the consideration of the Premium Committee, because the authors were Members of the Council; but a premium of books was awarded to George Ellis for the drawings with which he had illustrated Mr. Macneill's paper.

The papers by Professor Gordon, Glasgow, "On the Turbine;" by Professor Moseley "On the results of a trial of the Constant Indicator upon the Cornish Engine at the East London Water-works;" by Colonel Jones "On the forms of Breakwaters, &c.;" by the Rev. J. Clutterbuck "On the periodical Drainage and Replenishment of the subterraneous Reservoir in the Chalk Basin of London;" and by Mr. Charles Hood "On the peculiar changes in the internal Structure of Iron, independent of, and subsequent to, the several processes of its manufacture," were of such a nature as to excite animated discussions, which it is hoped will form an additional inducement for authors to continue to bring the results of their observations before the meetings of the Institution.

Several of the original communications which have been mentioned, are under the consideration of the Publication Committee, with a view to their being produced in the next volume of the Transactions, the first part of which is now in the hands of the engravers and printer, and will soon be circulated among the members: it would have appeared earlier, but that a due regard for the economical administration of the funds of the Institution caused the Council to hesitate in incurring the heavy expense of publication, so long as subscriptions to the amount of £633. 12s. 0d. remained unpaid: this amount of arrears will, it is confidently expected, be much reduced during the present Session, thus avoiding for the Council the painful necessity of suspending the names of defaulters, or of erasing them from the books of the Institution; and as the publishers (Messrs. Longman and Co.) have, by their attention to your interest, increased the sales during the past twenty months to the amount of upwards of £200, the Council feel justified in authorizing the publication of the commencement of another volume of the Transactions, which will be completed in two parts.

In the Annual Report of 1842 it was announced that a classified Catalogue of the Library would be speedily issued; considerable delay has however been occasioned by the necessity for a revision of it, which has occupied much time, and has not only retarded the production of this, but also of the Catalogues of Drawings and Original Communications; they are, however, in a forward state, and will be generally circulated as soon as they are printed.

On every occasion your Council have endeavoured to impress upon the members and friends of the Institution the importance of making it the depository of original papers of eminent engineers, and scientific men: they have now the pleasure of announcing that Mr. Cotton (the Governor of the Bank of England), with the concurrence of Mr. Turner, has presented a collection of original reports and other papers of the late Captain Huddart; their contents cannot fail to be valuable for reference; and, when they are arranged, they will undergo the scrutiny of the Publication Committee, in order that anything calculated for the Transactions may be immediately brought forward.

Acting upon the suggestions of Mr. Cotton, the Council have embraced the opportunity of purchasing from the widow of Captain Huddart's secretary a number of papers containing the calculations and results of a series of experiments made by Captain Huddart for the purpose of determining the resistance opposed by bodies of different forms in passing through water: the instruments which were used for these experiments have been also obtained, and Mr. Cotton has again exercised his liberality in presenting the curves used on the same occasion.

While on the subject of original MSS., the Council feel confident that members will be pleased to learn that Mr. Charles Brewin, of Oaklands near Birmingham, whose knowledge of the inland navigation of England eminently qualifies him for the task, has, at the re-

quest of your President, kindly undertaken to arrange the papers of the late Colonel Page, which have been for some time in the possession of the Institution; they have therefore been entrusted to Mr. Brewin, and under his care all that are available will be bound up in volumes, with tables of contents, so as to facilitate the means of consulting them.

It is proposed to arrange the Telford Papers in the same manner, in order that everything in the possession of the Institution may be rendered as extensively useful as possible.

The list of presents appended to this Report will show that the liberality of all classes, and of the friends of the Institution, has not diminished.

The Lord-Lieutenant of Ireland, and the Master-General of the Ordnance, continue to transmit, through your honorary member, Colonel Colby, R.E., the Maps of the English and Irish Surveys which are published under their auspices.

The additions to the Library have been valuable and numerous, and the interchange of publications with scientific societies, both in Great Britain and foreign countries, increases steadily.

The proceedings of the Institution are regularly reported in the periodical journals of this country, and are translated and circulated in foreign scientific publications, by eminent men, who exhibit anxiety to enter into regular correspondence with your society.

In order to facilitate the reference to the subjects contained in the minutes of proceedings of the past year, an Index has for the first time been published, and as soon as it is practicable the minutes of preceding years will be similarly treated.

The increase of the members of all classes has been satisfactory, and among them are many whose eminence renders them valuable acquisitions.

The list of honorary members has received considerable addition by the election of several noble and distinguished men, whose names must add lustre to the annals of your Institution; the newly elected honorary members are—Field Marshal the Duke of Wellington; the Duke of Buccleuch and Queensberry; the Marquis of Northampton, President of the Royal Society; the Lord Chancellor Lyndhurst; Lord Brougham and Vaux; Sir Robert Peel, Bart., First Lord of the Treasury; Charles Shaw Lefevre, Speaker of the House of Commons; Professor Airy; the Rev. Dr. Buckland; and the Rev. Dr. Robinson, of Armagh.

We have to regret the decease of the Right Honourable Lord Congleton, Mr. Samuel Seaward, Mr. Benjamin Hick, Mr. Charles Collinge, Mr. W. D. Anderson, Mr. John Smeaton, and Captain Foster, Bombay Engineers.

Sir Henry Parnell was born in the year 1776. After the usual routine of university education, he entered upon a parliamentary career as member for Queen's County, and became distinguished for his steady industry and application to business; his speeches abounded with facts and calculations, and in many political as well as financial questions he took a prominent part. In 1828 he was appointed chairman of the Finance Committee; subsequently he became Secretary-at-War and a member of the Privy Council; in 1835 he succeeded Lord Lowther in the office of Treasurer of the Navy, with which were consolidated the duties of Paymaster-General of the Forces and Treasurer of the Ordnance, which combined office he held until his elevation to the peerage in 1841 as Lord Congleton, of Congleton, in Cheshire.

These public duties did not prevent him from filling numerous private offices, among which may be principally noticed that of chairman of the Commissioners of the Holyhead Road. This post naturally created an intimacy between him and our first President (Mr. Telford), which was only interrupted by the death of the latter. The active mind of Lord Congleton being thus directed to engineering pursuits, he cultivated the society of other civil engineers, and became an honorary member of this Institution in 1833; his Treatise on the construction of Roads, and his Plan (adopted by the Post Office) for improving the construction of Mail Coaches, show that his acquirements in the practical details of professional subjects were not superficial. He published also several works on Finance, Banking, and the Currency, besides pamphlets on Catholic Emancipation and other political subjects.

The decease of his Lordship took place in the sixty-sixth year of his age, respected as a public character for his attainments, his general consistency, and his great industry, and regretted by a large circle of private friends.

Mr. Samuel Seaward, F.R.S., &c., was born at Lambeth in the year 1800, and at the age of fourteen years he entered the service of the East India Company as a midshipman; after his second voyage to Bombay and China he relinquished a naval career, and was placed by his brother as an apprentice with the late Mr. Henry Maudslay, in whose establishment he had the best opportunities of acquiring a practical knowledge of mechanics and engineering; of these opportunities he carefully availed himself, and always cherished a grateful recollection of his instructor. After passing about five years with Mr. Maudslay, he entered the services of Messrs. Taylor and Martineau, whence he proceeded to Cornwall, and assisted, under the direction of Mr. Arthur Woolf, in the erection of several large pumping engines; he then undertook the superintendence of part of the works of Mr. Harvey, at the Hayle Foundry, where he had the advantage of the instructions of Mr. Richard Trevithick.

In the year 1825 he returned from Cornwall and joined his brother, Mr. John Seaward, in the Canal Iron-works, Limehouse, as manufacturers of marine and other steam engines, as well as of general machinery.

The attention devoted by Mr. Seaward to the construction of marine engines particularly, and the successful adaptation of the "direct action" engines* (which were, it is believed, first introduced by Mr. Gutzmer, of Leith, on board the "Tourist" steamer), are well known in the profession.

His ingenuity and mechanical talents are manifested in all the works undertaken by the firm to which he belonged, and by several scientific pamphlets which he published.

He joined the Institution in the year 1828, and became subsequently an active and useful Member of the Council, and our Transactions are indebted to him for a memoir "On the application of Auxiliary Steam Power to sailing vessels on long Voyages."

Snatched from among us at the early age of forty-two years, the profession has lost an intelligent and zealous member, and his private friends a worthy and estimable man.

Mr. Benjamin Hick was born at Leeds in the year 1790, and was brought up as a practical engineer in the establishment of Messrs. Fenton and Murray, by whom at an early age he was entrusted with the superintendence and erection of several large engines, &c., and he was eventually offered a partnership in their works; this he declined, and, in 1810, engaged with Mr. Rothwell, in the Union Foundry at Bolton, of which he was the managing partner, and in 1833 he established the Soho Foundry, now carried on by his sons in that town.

His attention was directed to almost all branches of mechanics, and the ingenuity displayed in his inventions and improvements is generally acknowledged: some of his improvements have become public property without being claimed by him, or its being known from what source they emanated.

He became a member of the Institution in the year 1824, and although the distance of his residence precluded his frequent attendance at the meetings, he was a liberal contributor to the collection of models, &c.

His good taste, his integrity of character, the encouragement which he extended to talent of all kinds, and the assistance given by him to all public improvements, obtained for him considerable influence in the town of Bolton, where his loss will be much felt.

Mr. Charles Collinge was born in the year 1792, and being engaged from an early age in mechanical pursuits, he eagerly embraced the proposition of your Vice-president, Mr. Henry Robinson Palmer, to unite with him and a few more young men in forming a society for mutual improvement, by discussing scientific subjects; from this commencement, in the year 1811, has arisen the Institution of Civil Engineers, which now numbers five hundred and twenty-five members.

Mr. Collinge continued, through all the stages of its progress, an useful and active member; he took his share of the duties as a Member of Council, and filled the other offices of the Institution with readiness, and his attendance at the meetings was very constant.

Mr. W. D. Anderson was a pupil of our first President, Mr. Telford, after whose decease he travelled in Italy, whence he sent to the Institution a series of drawings of the Ponte Santa Trinita at Florence. On his return he was engaged under Mr. W. Anderson (his father), the engineer of the Grand Junction Water-works, on several surveys and other works. He then gave plans for, and was appointed engineer to, the Exeter Water-works, which situation he resigned in 1837, in order to become engineer to the corporation of Newcastle-on-Tyne, where he constructed some important works. Ill health obliged him to resign this latter appointment in the year 1841, and his decease took place during the last summer.

Mr. John Smeaton and Captain R. Foster, Bombay engineers, had only been elected during the past Session, and owing to the sudden decease of the former, and the shattered health of the latter, consequent on a lengthened residence in the East Indies, they had scarcely ever been able to attend the meetings of the Institution.

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The register of the signatures of the members still remains very incomplete; the Council would, therefore, beg the attention of mem-

* The engines of the "Gorgon," the first of a numerous class of Government steamers fitted with that kind of engine, were built at the Canal Iron-works.

bers to this point whenever they attend the meetings or visit the Institution.

The portrait of the President has been painted, and was exhibited at the Royal Academy during the past year: it is now in the hands of the artist in order that he may make some alterations which have been suggested, but it will shortly be placed on the walls of the meeting-room.

It has afforded the Council great satisfaction to witness the unanimity and energy which have marked the course of your proceedings, and they now resign into your hands the trust reposed in them, confident that the same course will be persevered in, and that you will study to maintain the reputation of the Institution, and to increase its sphere of usefulness; this, you are aware, can only be accomplished by the earnest co-operation of members of all classes, whose ambition it should be to show, by their regular attendance at the meetings, by taking part in the discussions, and by contributing useful papers for the Transactions, that they take a real interest in the welfare and progress of the Institution.

GREAT THAMES IMPROVEMENTS.

The Lords of the Treasury, the Commissioners of Public Works and the Corporation of London, caused some time ago a report and estimate to be made on embanking some portion of the river Thames. A select committee of the House of Commons took up the inquiry upon an infinitely more extensive scale, and engineers of first-rate eminence were employed to examine the river within the whole of the jurisdiction of the Lord Mayor, and to report upon the entire question of making the noble river advantageous in every respect to the public. By a great deal of labour the most satisfactory evidence has been collected and laid before the Government and the corporation, and from the active proceedings adopted, it appears reasonable to calculate that the health, beauty, and convenience of the metropolis will, without much delay, be considerably augmented.

On Wednesday last Special Courts of Conservancy were held at Westminster, the Borough, Greenwich, and Stratford, for the several counties whose lands embank the Thames, by the Lord Mayor, with the view to commence this great object.

The Recorder, in charging the several juries sworn to present any impediments and encroachments which might come within their notice in the various parts of the river, said they had been summoned specially that day to carry out the large objects confided to the corporation of London, and more particularly to the Lord Mayor, in the conservancy of the river Thames. It was scarcely necessary to remind them that the Lord Mayor possessed power of inflicting punishment upon all persons guilty of transgressing the regulations of the river, either as regarded the fisheries, which were formerly of considerable importance and magnitude, or the transcendantly more important question of the navigation. The Recorder then described the extent of his Lordship's jurisdiction, which he said the Lord Mayor held by special commission, and was recognized by many charters. These observations were, he said, applicable to the ordinary avocations of conservancy juries. Those he now addressed had been convened upon no ordinary occasion. The first duty of the Lord Mayor was to promote to the utmost the free navigation of the river, and to remove all obstructions to the enjoyment of its advantages by the public. The gentlemen he addressed could not be inattentive observers of the changes arising from the removal of old London Bridge, and the dams by which such an enormous body of water had been kept up, a measure by which, as was evident, serious alteration had taken place in the bed of the Thames at that particular spot. The other great change to which it was his wish to call the attention of the gentlemen was the immediate obstruction caused by the building of the houses of Parliament. By these two means the river had undergone very considerable alterations, the advantages of which, however, were more than a counterpoise to the inconveniences which in some respects resulted. He should quote a sentence or two from the report of the committee for the information of the gentlemen he addressed:—"In order to place the conservators of the river in a position to exercise their authority with becoming effect, it was recommended by counsel that they should immediately cause a survey to be made of the banks and bed of the river within the limits of their jurisdiction, and that a line should be laid down, beyond which all present and future encroachments upon the banks should be removed, by whatever authority and under what circumstances made, and regardless to whom they might belong; and in order that the corporation might be placed upon the highest possible ground in the course they were about to adopt, the counsel recommended that engineers of high character and standing in their profession should be employed to act with the officers of the committee in carrying into execution the proposed survey and report." The report went on to state,—"Your committee, strongly impressed with the wisdom and importance of the advice they have received, and feeling it was their duty not to allow the existing state of things to continue, without taking some decided steps to abate the evils complained of, directed application to be made to Mr. Walker, the president of the Institution of Civil Engineers (a gentleman at the head of his profession, and upwards of 30 years engaged in engineering works on the banks of the Thames,) to afford his valuable aid in the proposed survey, and they also made a similar application to the Lords Commissioners of the Admiralty for the assistance of Captain Bullock, R.N., one of the Hydrographers to that board, and a gentleman who, to the high reputation he enjoyed in his profession, added an intimate acquaintance with all parts of the Thames, having executed, under the authority of the Admiralty, the best plan extant of the lower parts of the river, from actual survey made by himself and his officers. Your committee are happy to say, that they were successful in both applications, and those gentlemen, assisted by Mr. Leach, the clerk of the works of the upper navigation, and by the waterbailiff and the principal harbour-master, and by the other harbour-masters in their several districts, have made a thorough inspection of the river Thames, through the whole extent of the city jurisdiction: they have likewise, in conformity with the recommendations of counsel, laid down upon plans prepared for that purpose lines on each bank, and have accompanied the same with elaborate reports upon the state and condition of the river, its existing defects, and the proposed remedies." The object proposed had been openly and actively pursued by the corporation, and on days to be appointed the juries would be attended by Mr. Walker and Captain Bullock, who would explain any difficulties which might occur. The juries were thus engaged in the performance of duties conjointly sanctioned by the Government and the corporation, and they were looked to with the utmost confidence for their due performance. They would also be expected to recommend such measures as might be in their opinion best calculated to meet the new state of circumstances, and what new alterations might appear to them most effectually adapted to advance the public utility. It was impossible not to admit that a most extraordinary change had occurred in consequence of the progress of steam navigation. The use of the Thames as a public highway had increased beyond all imagination. Five minutes did not elapse through the day without testifying to the energies of that power, by conveying from one place to another thousands of persons who thus found an accommodation which it would be impossible to remove or fetter. These considerations having been presented to the juries, their duty, they would see, was plain and obvious. They would point out every encroachment in the river, without balancing convenience with inconvenience. The public had a right to all the advantages which could be yielded in the width and depth of the stream, and therefore no permanent encroachment could be tolerated. The gentlemen appointed to do the duties of jurymen on this important occasion would be supplied with copies of the reports made by the engineers. It would readily occur to them that in a river which, to say nothing of its prodigious commercial importance, constituted the great drain of the metropolis, it was essential to preserve the activity and depth of its water. When he spoke of the Thames as being the drain of the metropolis, he by no means intended to be understood as intimating that the inhabitants on its banks would be tolerated in letting flow into it the refuse of gas or other noxious filth. Every offence of that description must be presented, and would be punished. It was matter of congratulation, however, that by means of an improved embankment the public health was capable of being seriously benefited by the depth and activity of the stream, whatever might be the pollution to which the water might be subjected. The juries would in their surveys find numberless encroachments, which had, in former days, been altogether innoxious, but which had become, by the remarkable changes to which he had adverted, very injurious to the navigation. They would present those encroachments, to be dealt with according to law, and they would have the able assistance of the city solicitor, who would afford them all the necessary facilities. It was the determination of the Lord Mayor, under the extraordinary circumstances to which the attention of the juries had been called, to make these courts as efficient as they were capable of being made consistently with the law and the constitution. The witnesses produced before the juries should be sworn witnesses, and nothing should be wanting either in form or substance, to enable them to carry into effect the great object described. The Recorder apologized for the great length of his addresses to the several juries, and pleaded the paramount importance of the subject as his excuse. The juries

were administering a trust of the greatest magnitude, and would put aside in the execution of it all private feelings and friendship, which would naturally operate in the ordinary occurrences of life.

The 11th day of March was appointed for the next court, on which day the several presentments will be made by the juries.

MISCELLANEOUS.

THE LAW COURTS IN THE CITY.—From a report made to the Court of Common Council, by the City Lands Committee, it appears that Mr. Tite has been chosen to prepare plans and designs for the City Law Courts. This gentleman and the City Surveyor have presented a report to the Committee, of which the following is the substance:—"In proceeding to study the general arrangements, the Committee is aware that we gave great attention to the question of the possibility of placing any or all of the courts on the ground-floor; and in order to determine this most important question, we laid before the Committee, at their meeting on the 14th of September, a series of plans, in which the attempt was made to place the Courts of Queen's Bench and Common Pleas on the ground-floor, and the Court of Exchequer on the one-pair floor. After due and careful examination, the committee were unanimously of opinion, that unless all the courts were placed on the one-pair floor, sufficient accommodation would not be obtained for the public, the counsel, the solicitors, and the witnesses. In this opinion we entirely acquiesce. On the ground-floor, we propose that the great entrance in Guildhall yard shall be mainly, if not entirely, used by the juries, witnesses, solicitors, and the public; that the entrance for the judges shall be from a door-way towards the east end in Guildhall-buildings, and that the counsel shall enter on the east side. In the public entrance we have thought it right to make the hall, staircase, and vestibule as open, light, and ample as possible. The rooms for witnesses, solicitors, or consultation, are seven in number, according to the plans, and their area in feet superficial is 2,828, exclusive of the halls, staircases, vestibule, and robing-room. We have prepared two elevations, one of the west front in Guildhall-yard, another of that to the south in Guildhall-buildings, together with a perspective view, which shows the general effect of the whole. In the interior of the building we have carried out the style adopted on the outside. The courts would have level ceilings, executed in imitation of the old carved and timbered ceilings of the Tudor period. By a reference to the plans, the committee will see that this design involves the re-construction of nearly all the present building. The foundations would, of course, be used to a great extent. The internal walls of the courts, and perhaps the back or eastern wall, it would be unnecessary to disturb; but everything at the back of the courts must be entirely reconstructed, and the two external front walls rebuilt. We have made sufficient general calculations to enable us to advise the committee that the works could be carried into effect at an expense not exceeding £10,000." As it is intended to remove the Court of Bankruptcy, and an additional space may then be obtained, the question stands over for consideration, as the difficulty of erecting the three courts on the same floor, and other inconveniences might then be altogether obviated.

MONUMENTS AT ROME.—Monuments are about to be erected at Rome to the memory of Metastasio, Visconti, and Pinelli. A Committee has been formed for the purpose, and Prince Odolascalchi is one of the most active members.

STRASBURGH MINSTER.—The choir of Strasburgh Minster is to be restored, and the work is to commence in the Spring; 15,500 fr. have been already subscribed for this purpose.

CATHEDRAL AT COLOGNE.—The Committee for completing the cathedral at Cologne, have voted 30,000 thalers for the works in the nave, and 10,000 for the north tower. King Louis of Bavaria has promised four painted windows, which are to be ready in 1847. An exhibition of paintings has been opened at Rome, to assist the funds for the same object.

NEWLY ELECTED ACADEMICIANS.—At a meeting of the Royal Academicians, held in Trafalgar Square, on the 10th ult., Sir William Ross was elected an Academician in place of Sir Francis Chantry, deceased; Mr. James Tibbitts Willmore an associate engraver, in the place of Mr. William Bromley, deceased. At the same time Mr. Henry Timbrell was elected a travelling student.

MR. BARRY has been elected a member of the Academy of St. Luke.

CHURCH OF WESTZAAN.—A letter from Amsterdam, Feb. 4, states that the tower of the church of Westzaan, in Southern Holland, one of the most remarkable monuments of the middle ages, has just fallen down. Last year it was observed that the upper part was slightly out of the perpendicular, and orders were given to prop it up. The architect to whom this operation was entrusted, took up his residence with his family in a little wooden house, constructed at the foot of the tower. The fall took place during the night, and the whole mass came down on the house, in which were the architect, his wife, three children, and four workmen. The tower was built in the ninth century, and its height was about 200 feet.—*Athenæum.*

HUMBOLDT'S "FRAGMENS ASIATIQUES."—Humboldt is preparing for press the second edition of his "Fragmens Asiatiques."

THE DEAD SEA.—"During the last year, Lieutenant Symonds, R.E., carried a line of levels across from Jaffa to the Dead Sea, by two different routes; and the results, corresponding to within an insignificant fraction, give 1311.9 feet for the depression of the Dead Sea below the Mediterranean, being a very few feet less than that given by M. Berton. Lieutenant Symonds, by the same operation, found the level of the Lake Tiberias to be only 328 feet below that of the Mediterranean, making an inclination of nearly 1000 feet between this lake and the Dead Sea, a distance of about 70 miles."—*Mr. Hamilton's Address to the Geographical Society.*

MEASUREMENT OF HEIGHTS IN THE HOLY LAND.—Russegger has measured barometrically the heights of several important localities in the Holy Land. Monastery of St. Catherine, on Sinai, 5115 Parisian feet; summit of Dschebel Horeb, 7097; summit of Dschebel Catherine, 8168; Jericho, 717 below the sea; bathing place of the Pilgrims in the Jordan, 1291 below the sea; Catholic Convent at Nazareth, 1161 above the sea; summit of Tabor, 1755; surface of the Lake of Tiberias, 625 below the sea; Dschebel Makmel, above Tripolis, the highest point of Lebanon, 6800 above the sea; the Cedars of Lebanon, above Eden, 6000; mountain pass between Beirout and Baalbeck, 5485; Breddin coal mines, 2906; Makla-ain-el-Bed coal mines, 2873; Mar-hanna-el-Kennise coal mines, 1803; room at Beirout, 60; mountain pass from Beirout to Damascus, 4886; town of Sebadâni, 4204; the Fall of Barada, at the pass of el-Suk, 3346; the town of Baalbeck, 3196; Damascus, 2304.

The mountain elevations in Lebanon and Antilebanon are older than those of Southern Syria. The former belong to the chalk formation, but the latter to the tertiary deposits. This fact seems to correspond perfectly with the physical description of the surface.—*Poggendorff's Annalen.*

GEOLOGICAL MAPS.—Sismondi's Geological Map of Piedmont and Savoy is nearly ready for publication; and Pareto's Geological Map of the Duchy of Genoa and County of Nice is almost finished.

LIST OF PATENTS.

SIX MONTHS FOR ENROLMENT.

(*Continued from page 64.*)

George Benjamin Thorneycroft, of Wolverhampton, iron-master, for "improvements in furnaces used for the manufacture of iron, and also in the mode of manufacturing iron."—Sealed January 31.

William Maugham, of Newport-street, Lambeth, chymist, for "an improvement in preparing ærated soda water."—Sealed January 31.

William Barnard Boddy, of St. Mary, Newington, surgeon, for "improvements in apparatus and means for opening, shutting, and fastening every description of sliding and lifting window sashes, windows and window shutters."—Sealed January 31.

William Robinson Shaw, of Leeds, engineer, for "certain improvements in feeding or supplying steam boilers with water."—Sealed January 31.

Samuel Kirk, of Stalybridge, Lancaster, cotton spinner, for "certain improvements in machinery, or apparatus for preparing cotton and other fibrous substances for spinning."—Sealed January 31.

Charles Hancock, of Grosvenor Place, artist, for an "improved means of dyeing or staining cotton, woollen, silk, and other fabrics, and rendering them repellent of water and moisture."—Sealed January 31.

Charles Clark, of Great Winchester-street, London, merchant, for "an improved pyro-hydro pneumatic apparatus, or means of generating, purifying, and condensing steam and other vapours, and of extracting from vegetable substances the soluble portions thereof; as also the application of parts of the said apparatus to other heating, evaporating, and distilling purposes."—Sealed January 31.

James Clark, of Glasgow, power-loom cloth manufacturer, for "an

improved mode of manufacturing certain descriptions of cloths."—Sealed February 1.

John Hill, of Manchester, machine maker, for "certain improvements in, or applicable to looms for weaving carpets and various other fabrics, in which raised loops or a raised pile constitute the face or the figure of the fabric."—Sealed February 11.

Robert Hicks, of Old Burlington-street, Middlesex, surgeon, for "certain improvements in apparatus for impregnating liquids with gas."—Sealed February 11.

Joseph Morgan, of Manchester, manufacturer of patent candle-making machines, for "improvements in the manufacture of candles."—Sealed February 11.

Jonathan Badger, of Sheffield, carpenter and builder, for "improvements in the construction of bedsteads for invalids."—Sealed February 11.

Christopher Nickels, of York Road, Lambeth, gentleman, for "improvements in the manufacture of fabrics made by lace machinery."—Sealed February 11.

Thomas Ensor, of Melbourne Port, glove manufacturer, for "improvements in the manufacture of leather gloves."—Sealed February 11.

Henry Du Bochet, of South Mall, Ireland, piano-forte tuner, for "a new method of making piano-fortes."—Sealed February 11.

Thomas Wolverstan, of Salisbury, iron founder, for "certain improvements in axle-trees and axle-tree boxes."—Sealed February 11.

Alfred Brewer, of Surrey-place, Old Kent Road, wire weaver and felt manufacturer, for "improvements in machinery for manufacturing paper." Being a communication. Sealed February 11.

George Ebenezer Doudney and Edward Phillips Doudney, of Mile-end, Portsea, candle-manufacturers, for "improvements in the manufacture of dip and mould candles."—Sealed February 17.

James Boydell, jun., of Oak Farm Iron Works, near Dudley, iron-master, for "improvements in apparatus for retaining the wheels of carriages, in the event of an axis breaking, or otherwise."—Sealed February 17.

Henry Ross, of Leicester, worsted manufacturer, for "improvements in combing and drawing wool, and other fibrous substances."—Sealed February 17.

Charles Brook, of Meltham Mills, York, cotton-spinner, for "certain improvements in the apparatus used for purifying gas."—Sealed February 17.

William Newton, of Chancery-lane, civil engineer, for "an improved system of working coal mines, and quarries of stone, marble, and slate, which may also be applied to the making of tunnel borings, or to other purposes of the like kind,"—being a communication. Sealed February 20.

John Kymer, of Pontardalais, South Wales, coal proprietor, and Thomas Hodgson Leighton, of Llanlley, Carmarthen, chemist, for "improvements applicable to the burning anthracite or stone coal, and other fuel for the purpose of obtaining heat."—Sealed February 21.

Joseph Crannis and Robert Kemp, both of Southwark, furriers, for "certain improvements in wood paving."—Sealed February 21.

Benjamin Brunton Blackwell, of Newcastle-upon-Tyne, gent., and William Norris, of the city of Exeter, civil engineer, for "an improvement in coating iron nails, screws, nuts, bolts, and other articles made of iron, with certain other metals."—Sealed February 21.

Lawrence Holker Potts, of Greenwich, doctor of medicine, for "a new or improved method or methods of conveying goods, passengers, or intelligence."—Sealed February 21.

Henry Clarke, of Drogheda, Ireland, linen merchant, for "improvements in machinery for lapping and folding all descriptions of woven textures and surface fabrics."—Sealed February 23.

Francis Roubiliac Conder, of Highgate, engineer, for "improvements in the cutting and shaping of wood, and in the machinery for that purpose," being a communication.—Sealed February 23.

John Haggerston Leathes, of Norwich, gent., and William Kirrage, of the same place, asphalte manufacturer, for "certain improvements in coffins."—Sealed February 25.

TO CORRESPONDENTS.

We have been prevented, by want of space, from inserting the Reviews this month.

In the next number we shall give a table of the prices of building materials, which will be continued quarterly.

We have received several important foreign communications, which will appear in our next number.

The Report of the South Shields Committee upon Accidents in Mines we shall take an early opportunity of bringing fully before the attention of our readers.

An Architect, Devon, we hope to hear from again.

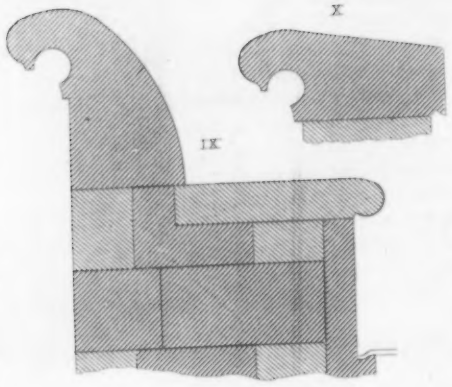
A Civil Engineer and S. P. S. are thanked for their kind letters. Their communications will be acceptable.

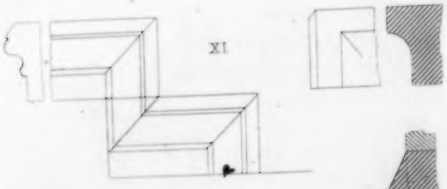
H. H. The details to which he refers will be exceedingly valuable, and are suitable for our pages.

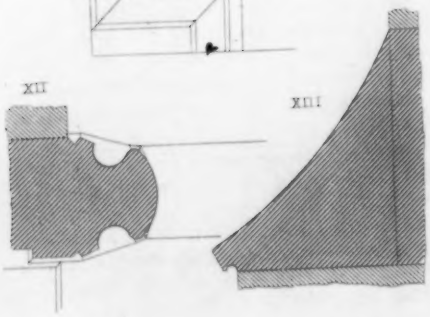
A Member of the Architectural Institute will oblige us by communicating the paper of which he speaks.

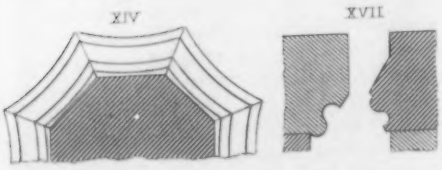
In the next number an additional half sheet will be given, to contain the proceedings of the Architectural Institute, and Institution of Civil Engineers, which it has been found impossible to introduce in the present number.

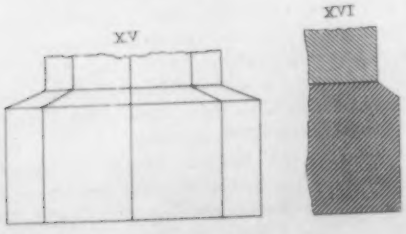
ELEVATIONS & DETAILS

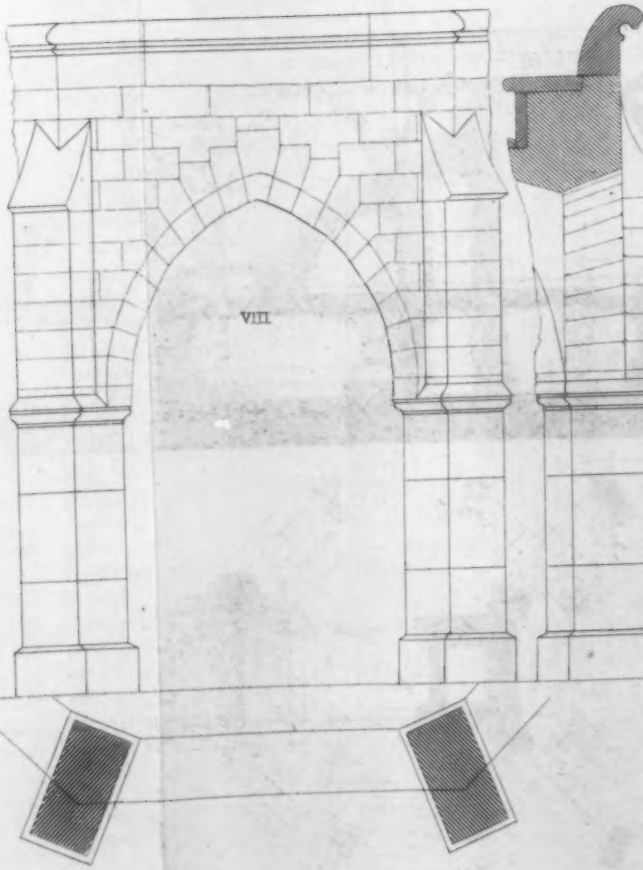












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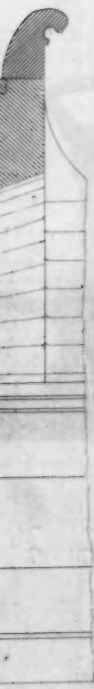

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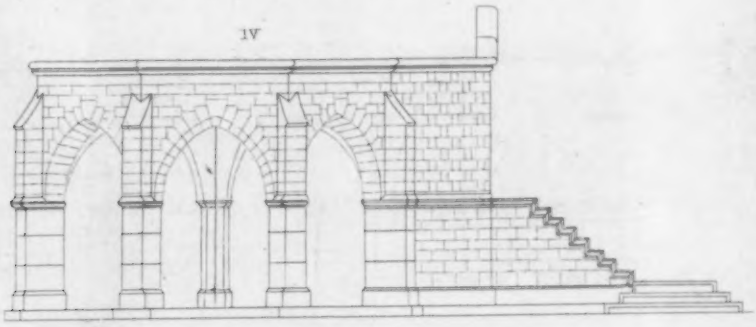

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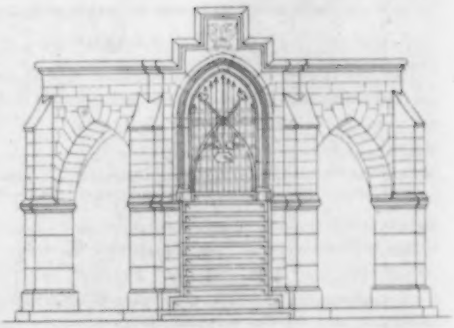

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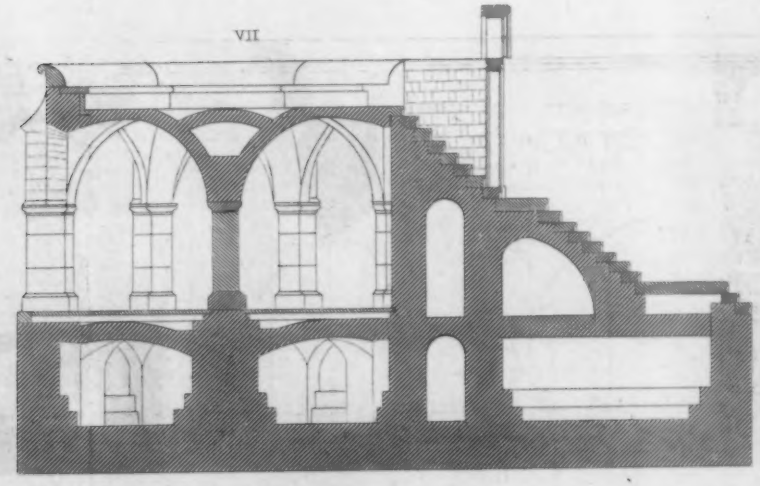

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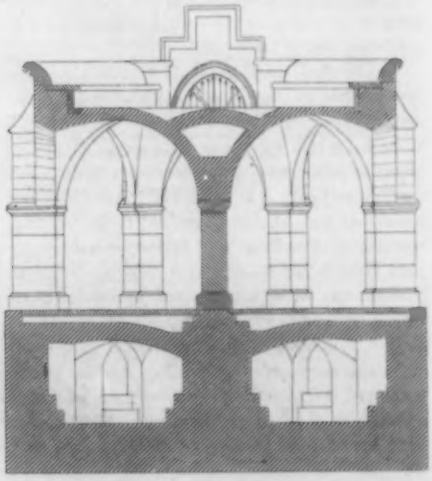

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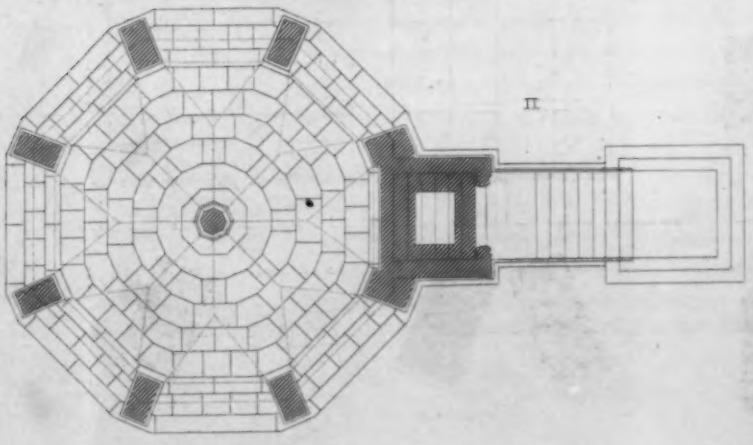

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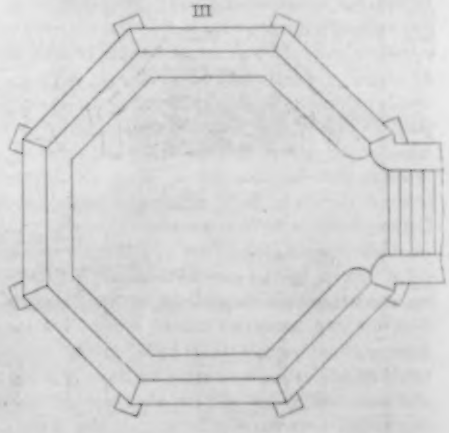

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